DEPARTMENT OF NATIONAL DEFENCE
CANADA

OPERATIONAL RESEARCH DIVISION

DIRECTORATE OF OPERATIONAL RESEARCH (JOINT & LAND)

ORD PROJECT REPORT PR 9905

IRON RENAISSANCE

EVALUATION OF THE LAV III COMBAT TEAM IN CONVENTIONAL WAR OPERATIONS

by

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MARCH 1999

OTTAWA, CANADA

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IRON RENAISSANCE

WAR GAME SERIES
1998

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ABSTRACT

This study evaluates the infantry combat team equipped with the LAV III compared to the present day combat team equipped with the M113A3 for conventional operations in war in the year 2006. Since consideration is being given to totally replacing the M113 family of armoured personnel carriers and TOW Under Armour with the LAV III within infantry battalions, emphasis is given to evaluating the various LAV III deployment options in the defense and attack.

The study finds that the LAV III is more combat effective and versatile than the M113A3. The LAV III proved itself to be most effective when under section control. However, limitations on its mobility, protection and firepower restricted its tactical flexibility and deployment. The study recommends a review of three doctrinal issues – Command and Control; Clearing an Objective vs Loss of Momentum; and Firebase Tasks.

RÉSUMÉ

Cette étude compare l'équipe de combat d'infanterie dotée du VBL III avec la structure actuelle, équipée du M113A3, dans le cadre d'opérations de guerre conventionnelle à l'horizon 2006. Considérant que le VBL III pourrait remplacer, au sein du bataillon d'infanterie, la totalité des M113 employés comme transport de troupe et comme plate-forme pour le TOW embarqué, plus d'effort a été consacré à l'évaluation de divers déploiements défensifs et offensifs du VBL III.

L'étude démontre que le VBL III est supérieur en situation de combat et qu'il est plus polyvalent que le M113A3. Le VBL III s'est avéré le plus efficace lors qu'il relève de la section. Par contre, les limites du VBL, quant à sa mobilité, son blindage et sa puissance de feu, restreignent sa souplesse tactique et son déploiement. L'étude recommande une révision de trois aspects de doctrine: le commandement et le contrôle; le dégagement des objectifs versus la perte d'élan; et les tâches de la base de tir.

EXECUTIVE SUMMARY

The Defence White Paper of November 1994 stated the need for Canada to modernize its armoured personnel carrier (APC) fleet to operate effectively in the combat conditions encountered in United Nations and other multinational missions. The White Paper set out a two-part programme that would involve upgrading some of the existing APCs and adding new ones, with delivery forecasted to begin in 1997. By August 1998, the Government of Canada had approved the purchase of 360 Generation III Light Armoured Vehicle APCs (designated LAV III) from General Motors (Diesel Division) of Canada. Another buy of the LAV III is being considered which would totally replace the M113 APC and TOW Under Armour within infantry battalions.

The introduction of the LAV III should provide the infantry with a range of capabilities which is expected to have an impact on doctrine, tactics, training, career progression, maintenance and logistics. The Directorate of Army Doctrine requested the Directorate of Operational Research (Joint and Land) evaluate the infantry combat team equipped with the LAV III compared to the present day combat team equipped with the in-service M113A3 for conventional operations in war in 2006. This report describes the operational research study into the LAV III project, which was named IRON RENAISSANCE.

Both defence and attack operations were required to investigate the capability of the LAV III in warfighting tasks.

a. Defence Vignette. A BLUE forward company and those elements of the BLUE battle group that could support the company defended against a RED Motor Rifle Regiment's attack. The remainder of the BLUE battle group was not considered to permit higher fidelity gaming. Only those RED forces involved in supporting the main attack were gamed.

b. Advance and Quick Attack Vignette. A BLUE mechanized infantry battle group advanced to clear a RED forward security detachment of company strength. In IRON RENAISSANCE, only one combat team attack, with support from those battle group elements that could support its advance

and attack was gamed. RED's force comprised a platoon strong point supported by tanks and an anti-tank detachment. The entire RED force was entrenched in a single defensive position, with a dummy position sited forward.

The study clearly demonstrated in both the attack and defence that the LAV III was superior to the M113A3 in supporting the infantry combat team.

a. Defence. In the defence, both the LAV III and M113A3 battle groups were successful at defending the position. However, the range of the LAV III's 25mm cannon allowed it to engage and destroy RED's BMP-2s before the infantry could dismount and attack the defensive position. The .50 cal heavy machine gun of the M113A3 was unable to destroy RED's BMP-2s before the infantry could assault and establish a foothold on the position. The LAV III battle group suffered only 2/3 the losses and achieved 1.6 times the loss exchange ratio of the M113A3 battle group. The LAV IIIs in the infantry company were responsible for killing three times the number of key RED systems as the .50 cal HMG of the M113A3 company.

b. Attack. In the attack, the LAV III was again superior to the M113A3 in supporting the infantry combat team. The LAV III contributed significantly to BLUE's success because of its improved firepower and protection. The M113A3 had no impact on RED casualties because of the vulnerability to small arms and indirect fire of the crew commander and the pintle-mounted HMG. In general, the M113A3 combat team lost one Leopard C2 and 21 infantry soldiers more than the LAV III combat team.

When evaluating deployment options, it was found that the LAV III does not have the protection to allow it to manoeuvre in the presence of the enemy. Furthermore, the mobility of the wheeled LAV III restricts its flexibility to manoeuvre and to adapt to current battlefield situations. Finally, it was noted that sabot fragments from LAV IIIs firing Armour Piercing, Fin Stabilized, Discarding Sabot ammuntion would pose a risk to dismounted soldiers deployed in close proximity.

a. Defence. In the defence, the LAV III was most effective when dug in on the position as an integral part of the infantry company where it was better concealed, more dispersed, and better protected. LAV III firepower was more likely to be available at maximum effective range forward of BLUE's main defensive position when it was most needed - during RED's assault. When sited to the flank(s), forward or behind, or employed in a counter-attack role, the effectiveness of the LAV III was reduced for three reasons. First, it was required to manoeuvre in the face of the enemy. Second, the range and availability of its firepower was reduced. Third, the LAV IIIs lacked the area to disperse thereby increasing the likelihood of being detected and neutralized.

b. Attack. In the attack, the LAV III was most effective when deployed with its section, providing intimate support to the dismounted infantry from behind or in close proximity. Intimate support LAV IIIs were more responsive to the immediate needs of the assaulting dismounted infantry, being able to provide continuous effective direct fire support on or near the objective in conjunction with tanks. The LAV IIIs could react quickly and effectively to previously undetected enemy positions, enemy indirect fire and enemy counter-attacks. Being in close proximity to the supported infantry, the LAV IIIs could perform immediate resupply, providing additional ammunition and those weapons not carried on the assault when needed. Furthermore, the infantry could remount the LAV III quickly and redeploy as required. However, the LAV III was vulnerable to RED's short range anti-armour systems when operating in the area of the objective. Deploying the LAV III to one or both flanks as a near firebase immediately following the dismount of the assaulting infantry would keep the LAV IIIs out of the effective range of RED's short range anti-armour systems. Being further away from the supporting tanks and infantry, the LAV IIIs could not always detect or provide firepower onto priority targets. It took more time to move forward to perform immediate resupply or to remount the infantry.

None of these deployment options should be discounted outright, however, tactical commanders must be aware of the associated risks.

Evaluating the impact of the LAV III on task organizations revealed that the more effective firepower of the LAV III does not and cannot compensate for the reduction of an assaulting force. The reduced firepower from a platoon of LAV IIIs compared to a company of LAV IIIs enabled RED to destroy proportionally more of the assault force. However, a platoon does not have the critical mass to sustain casualties, to clear an objective normally assigned to a company and to react to new or changing situations during the assault.

IRON RENAISSANCE identified the requirement for a review of the following doctrinal issues:

a. Command and Control. An effective means of commanding and controlling the ZULU LAV III and integrating its firepower with that of the infantry and support tanks must be established. Guidelines or procedures should be produced identifying the responsibilities and locations of commanders during the defence, advance, and attack.

b. Clearing an Objective vs Loss of Momentum. An effective means of maintaining the momentum must be established during the advance. The responsibilities of following forces must be clarified.

c. Firebase Tasks. The current doctrine is too restrictive regarding the responsibilities of the firebase during the fight through the objective phase of an attack. Guidelines or procedures should be produced giving discretion to tactical commanders.

This report demonstrates that the LAV III is more combat effective and versatile than the M113A3. The LAV III proved itself to be most effective when under section control, however, limitations on its mobility, protection, and firepower restrict its tactical flexibility and deployment.

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IRON RENAISSANCE
EVALUATION OF THE LAV III COMBAT TEAM IN CONVENTIONAL WAR OPERATIONS

I. INTRODUCTION

BACKGROUND

1. The Defence White Paper of November 1994 stated the need for Canada to modernize its armoured personnel carrier (APC) fleet to operate effectively in the combat conditions encountered in United Nations and other multinational missions. The White Paper set out a two-part programme that would involve upgrading some of the existing APCs and adding new ones, with delivery forecasted to begin in 1997.

2. By August 1998, the Government of Canada had approved the purchase of 360 Generation III LAV APCs (designated LAV III) from General Motors (Diesel Division) of Canada. The purchase will provide LAV IIIs to the Infantry School, and 59 to each of four infantry battalions. Artillery tactical teams (battery commanders and forward observation officers) and engineer recce parties affiliated to these battalions will receive LAV IIIs. Another buy of the LAV III is being considered which would totally replace the M113 APC and TUA within infantry battalions.

3. The introduction of the LAV III should provide the infantry with a range of capabilities which is expected to have an impact on doctrine, tactics, training, career progression, maintenance and logistics. The Directorate of Army Doctrine (DAD) requested the Directorate of Operational Research (Joint and Land) (DOR(J&L)) be tasked to determine the doctrinal implications and options concerning the introduction of the LAV III into the structure of the mechanized infantry battalion in the year 2006 (Reference 1). Army Research Board secretarial approval for the project was given at Reference 2. The Project Directive is found at Reference 3.

4. This report describes the operational research study into the LAV III project, which was named IRON RENAISSANCE.

AIM

5. The aim of this study was to evaluate the infantry combat team equipped with the LAV III compared with the present day combat team equipped with the in-service M113A3 for conventional operations in war in the year 2006.

SCOPE

6. The scope of this study was limited to:

a. War gaming was used as a venue for gathering necessary data;

b. The study employed combined arms attack and defence vignettes at battle group level;

c. War gaming was conducted on European mixed terrain during daylight in summer weather;

d. The tasks of the infantry combat team in warfighting were drawn from The Battle Group in Operations (Reference 4) and The Combat Team Commander's Handbook (Reference 5);

e. Manoeuvre Warfare tactics were defined in:

(1) Land Force Tactical Doctrine (References 6 and 7), and

(2) The Conduct of Land Operations (Reference 8);

f. Thermal imaging sensors were capable of defeating all smoke;

g. The BLUE direct fire support vehicle used in the project was the Leopard C2, armed with a through-the-barrel missile (TBM). Details of the TBM are attached at Annex A;

h. Weapons of mass destruction were not employed in the study;

i. Close air support, electronic warfare, counter-bombardment, and logistics were not modelled as they would not have contributed directly under the gaming circumstances; and

j. Threat forces were defined from Generic Forces circa 2006 (Reference 9).

OBJECTIVES

7. The objectives of IRON RENAISSANCE were to:

a. Evaluate the impact the LAV III has on the infantry combat team's area of responsibility;

b. Evaluate the effectiveness of the ZULU LAV III employed as a local counter-attack force in conjunction with tanks;

c. Evaluate the significance and effectiveness of the LAV III deployed forward of the main defensive position, dug in on the defensive position, and dug in on the flanks of the defensive position;

d. Determine and evaluate the impact of the LAV III on the size of the combat team and the size of the infantry assaulting force;

e. Evaluate the effectiveness of the LAV III when used to carry infantry near and onto the objective;

f. Evaluate the effectiveness of the LAV III when used as a firebase and when used in the intimate support role with dismounted infantry; and

g. Provide comments on doctrinal, tactical and organizational issues where possible.

II. METHODOLOGY

TOOLS

8. To account for the synergies present in battle group operations and for the large amount of data to be collected and analyzed, the two war games described below were chosen to examine the study objectives.

Computer-Assisted Board Game (CABG)

9. This war game provides a controlled environment within which the military game players get a co-ordinated overview of the scenario. Game controllers use the output from the CABG to ensure that sufficient interaction is occurring between opposing forces to generate the required data and to refine the scenarios before the start of computer play. Although the combat results from the CABG are not appropriate for quantitative analysis, observations are gathered from the game players for later qualitative analysis.

Janus

10. Janus is a computer game that simulates combat systems and the environment at the tactical level. Military players control the movement of forces and react to detections and engagements by interacting with a computer screen. The screens provide each user with a two-dimensional overhead view of the battlefield, icons that represent the forces involved, and a menu that allows the user to control the icons. Forces are defined as a group of systems. The probability of each system detecting, killing, and surviving must be accurately defined in the Janus database. Janus is a versatile tool for simulating ground combat and is capable of modelling many of the factors that influence the outcome.

11. Results from Janus, like any war game, are affected by the assumptions and modelling techniques used by the model's developers. For example, the user interacts with a graphical screen that provides perfect situational awareness of players' forces, therefore, it is assumed that all forces have battle management systems, and commanders have near-perfect command and control. Human factors such as training, morale, fatigue, fear, and aiming error are not considered. Consequently, weapon systems perform at the theoretical maximum rather than at the operational norm. These and other modelling limitations do not diminish the credibility of Janus output but bear consideration when evaluating results. Janus is a powerful tool for comparing two or more systems or various tactics as the limitations of the model apply equally to all games.

12. The study was conducted as an interactive, two-sided, closed war game using Janus version 6.0 (C6) and DOR(J&L)'s unclassified database version 6.06 (Reference 10). The scenario was gamed using 50m resolution digitized terrain of the HÜNFELD and BAD HERSFELD areas of Germany.

ANALYSIS

13. Qualitative Results. Qualitative results are based on military Judgements and Insights (J&I). J&I are formulated through group discussions between the military game players. The results of J&I are based on careful synthesis of players' observations during war gaming combined with individual expertise and background.

14. Quantitative Results. Quantitative results are based on the statistical analysis of Janus output files. J&I are supported by quantitative analysis where possible.

MEASURES OF EFFECTIVENESS

15. The following Measures Of Effectiveness (MOE) were used to compare the LAV III with the in-service M113A3 APC in accomplishing warfighting tasks:

a. Mission Success. Was the battle group successful in performing its mission statement?

b. Loss Exchange Ratio (LER). How many RED systems were killed for each BLUE system lost?

c. Residual Combat Strength. Would the battle group be capable of accepting a follow-on mission?

d. Lethality. What contribution did the LAV III/M113A3 make to the mission and how successful were they at destroying RED systems?

e. Survivability. Which RED systems were destroying the LAV III/M113A3 and how successful were they at surviving the attack?

f. Mobility. How did the mobility characteristics of the LAV III/M113A3 affect their performance?

g. Vehicle Capabilities. What capabilities are required for the LAV III to perform its mission effectively?

h. LAV III Organization. Was the LAV III organization suitable?

i. LAV III Doctrine and Tactics. Were the LAV III doctrine and tactics suitable, or what improvements/recommendations can be made?

Mobility Analysis

16. Both CABG and Janus are incapable of analyzing mobility issues in detail. The CABG relies on a series of movement tables which are applied by the game controllers. There is no explicit consideration of tactical mobility considerations (soil conditions, micro-terrain features, obstacle crossing, slope, road effects, etc). The movement model within Janus takes some of these factors into consideration. Janus considers slope, the difference in tactical mobility between tracked and wheeled vehicles, and surface culture (vegetation, roads, etc). Janus does not represent detailed movement issues, nor does it allow the analysis of operational mobility. Therefore, the analysis of LAV III's mobility was limited to J&I.

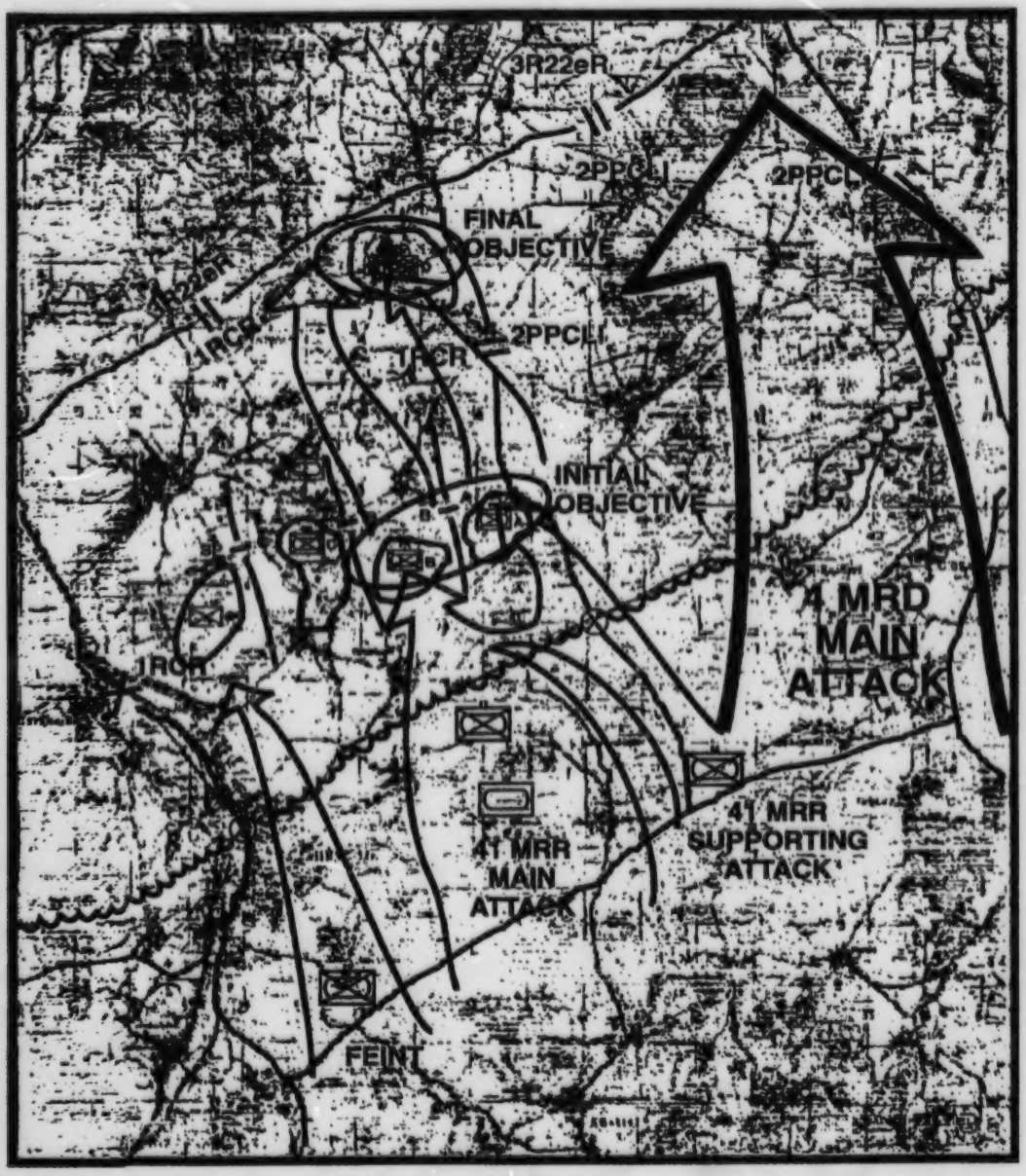
SCENARIOS

17. Both defence and attack scenarios were required to investigate the capability of the LAV III in warfighting tasks. To reduce the time required to develop the scenarios, defence and attack "vignettes" were extracted from previously gamed scenarios. Vignettes take less time to game as only the forces in the vignette need to be gamed as opposed to all the forces in the larger scenario. A vignette can be thought of as a battle within a larger scale operation. Modelling vignettes increases the statistical significance of the results as one can reduce the time required to play a single game and increase the number of iterations of each game that can be played in a given time period. The general scenario helps to keep the vignettes in perspective by providing a realistic framework within which the vignettes take place. Suitable vignettes were found in the IRON JOUST war game series that was conducted by DOR(J&L) in 1993/94 (Reference 11).

IRON JOUST BLUE Defence Scenario

18. In the IRON JOUST General Scenario, a BLUE Canadian brigade group (CBG) defended against a RED motor rifle division (MRD) as shown in Map 1. The CBG defended with two battle groups forward along a WEST-EAST line against an attack from the SOUTH. The battle group (1RCR) gamed in IRON JOUST was defending right forward. It was deployed with three rifle companies forward and a fourth rifle company in depth. A fifth company-sized ad hoc grouping based on the Combat Support Company was deployed right

forward covering the close terrain to the WEST. A tank squadron deployed a tank troop in hides located on each flank of the battle group. The remaining tanks of the tank squadron were in hides to the rear of the forward companies awaiting orders to move forward to firing positions.



Map 1: IRON JOUST BLUE Defence

19. The RED MRD was advancing on two axes with the objective of securing crossings over the Rivers HAUNE and FULDA. The secondary axis, the one allotted to 41 Motor Rifle Regiment (MRR), was gamed in IRON JOUST. The MRR attacked on two motor rifle battalion axes towards its initial objective, BLUE's forward defensive positions. The regimental second echelon, comprising a tank battalion, reinforced by a company of divisional tanks, advanced along the main attack axis with orders to exploit the success of either attack and secure the town of EITERFELD (final objective) supported by reconnaissance and anti-tank elements. To mask RED's true intentions and to provide support for the operation, RED launched a diversionary, feinting attack by a MR battalion against the western portion of BLUE's defensive line.

IRON RENAISSANCE Defence Vignette

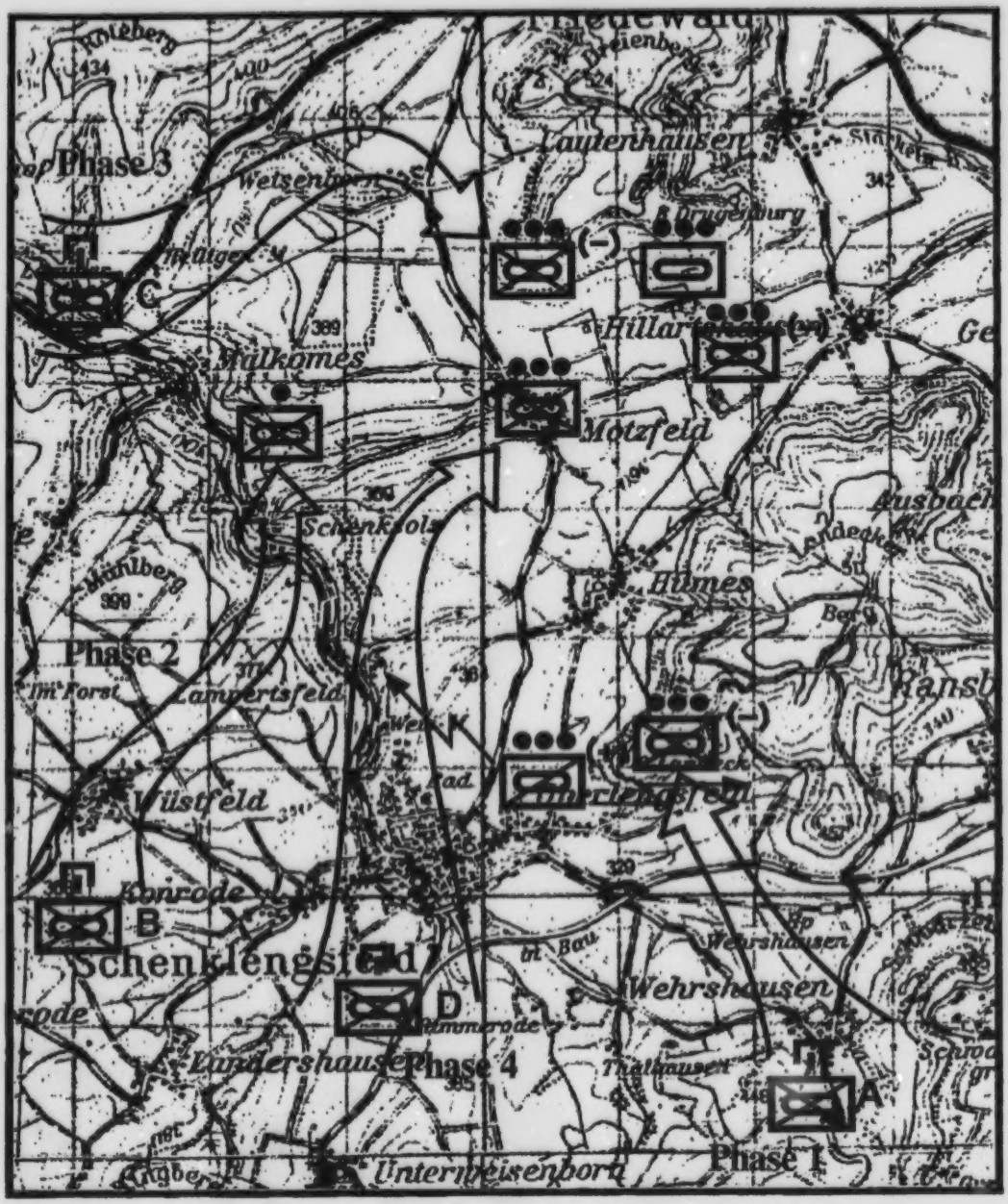
20. The RED attack against the left-centre forward company ('B' Company) and those portions of the 1RCR battle group that could support B Company was extracted from IRON JOUST for use in this vignette. The remainder of the BLUE battle group was deleted from the vignette to permit higher fidelity gaming. Only those RED forces involved in or supporting the main attack (first and second echelons) were gamed in this vignette.

IRON JOUST BLUE Advance Scenario

21. In the IRON JOUST General Scenario, BLUE was advancing with a CBG against a withdrawing enemy. The CBG was deployed with one mechanized infantry battle group leading, which in turn advanced with two combat teams forward. The battle group was required to conduct a four-phased operation in order to clear a RED forward security detachment of company (+) strength from the axis of advance as shown in Map 2. These phases would consist of a series of combat team level attacks against various RED outposts/strongpoints in Phases 1-3, culminating in a battle group attack on the RED company's depth position(s).

IRON RENAISSANCE Advance and Quick Attack Vignette

22. In IRON RENAISSANCE, only the Phase 1 attack by A Company combat team was war gamed. BLUE's force comprised only the A Company combat team and those elements from the battle group that could support its advance and quick attack.



Map 2: IRON JOUST BLUE Advance

III. RESULTS

GENERAL

23. The *quantitative* results presented below are based on the average of four interactive Janus runs for each vignette and each vehicle. The analysis will be discussed by each objective in turn using the MOEs previously identified.

EXCURSIONS

24. General. During gaming, excursions were identified to examine the sensitivity of the results to various factors and to consider certain doctrinal issues that were raised during the conduct of the iterations.

25. Defence Vignette. Analysis of the Defence Vignette raised two concerns. The study was based on the Leopard C2 being able to fire a through-the-barrel missile (TBM). However, this munition is not in-service and may not be available to the Canadian Forces in future. At the same time, the study was based on RED being equipped with the basic BMP-2, although it is possible to equip it with Explosive Reactive Armour (ERA). It was decided to examine the effectiveness of the LAV III combat team when BLUE's TBM was removed and RED's BMP-2s were equipped ERA. Furthermore, numerous incidents were reported where the attacker had acquired the defender's vehicles in the objective area, but could not engage them. Janus required a target to be at the recognition level of detection before it could be engaged. Therefore, it was decided to examine the effectiveness of the defender in sustaining an increased volume of fire from the attacker by lowering the level of detection required by the attacker to engage. To address the aforementioned concerns, the following excursion games were conducted:

a. Removing BLUE's TBM and equipping RED's BMP-2s with ERA; and

b. Allowing the RED attacker to fire at the objective area on detection rather than at the recognition level of detection.

26. Advance and Quick Attack Vignette. Analysis of the Advance and Quick Attack Vignette raised the same concerns detailed above in the Defence Vignette. In this vignette, because the defending force was much smaller and the attacking force was able to close onto the entrenched positions, there were concerns over the continuous, effective fire on the objective by the firebase, particularly while the assault element was fighting

through the objective. It was decided to examine the effectiveness of the LAV III combat team in the assault when fire control measures were imposed on the firebase. To address all of these concerns, the following excursion games were conducted:

a. Removing BLUE's TBM and equipping RED's BMP-2s with ERA;

b. Allowing BLUE to fire on detection at the objective area while RED fired on recognition;

c. Forcing BLUE to adopt tighter fire control measures over his firebase. This made the BLUE firebase less effective in engaging targets of opportunity on the objective area while BLUE's assault force was fighting through the objective; and

d. Removing BLUE's TBM and providing ERA to the BMP-2s and forcing BLUE to adopt tighter fire control measures over his firebase.

DEFENCE VIGNETTE

BLUE FORCE STRUCTURE AND CONCEPT OF OPERATIONS

27. In IRON RENAISSANCE, the BLUE force comprised:

a. B Company, equipped with LAV IIIs (M113A3s in the baseline game);

b. A fourth LAV III/M113A3 mechanized infantry platoon from A Company, located in the wooded spine EAST of B Company;

c. The battle group's Leopard C2 tank squadron;

d. The reserved demolition firing parties from the supporting field engineer squadron;

e. The in-location detachments from the recce and anti-armour platoons; and

f. Indirect fire resources consisting of two batteries of M109A4s and one mortar platoon to support the battle group.

Figures 1 and 2 detail BLUE's structure for IRON RENAISSANCE.

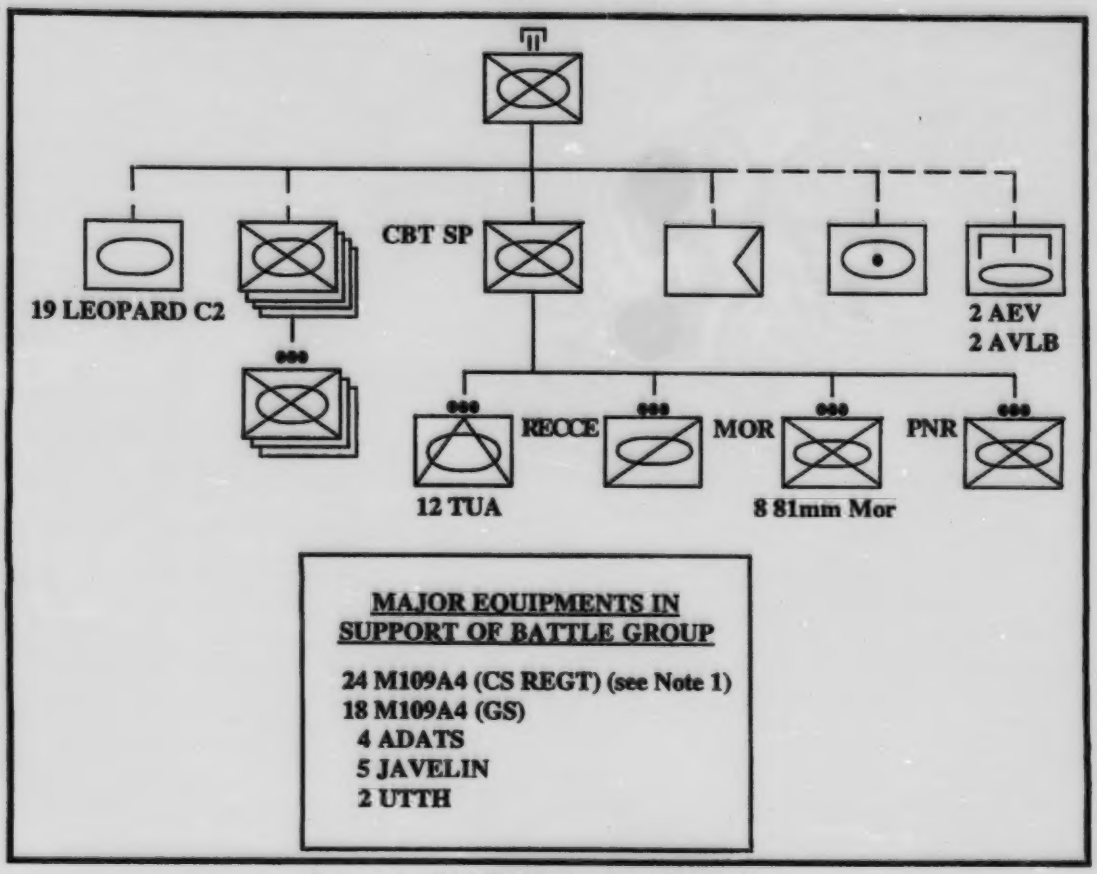


Figure 1: BLUE Mechanized Battle Group

Note 1: A maximum of two M109A4 batteries and the mortar platoon were available to support the battle group.

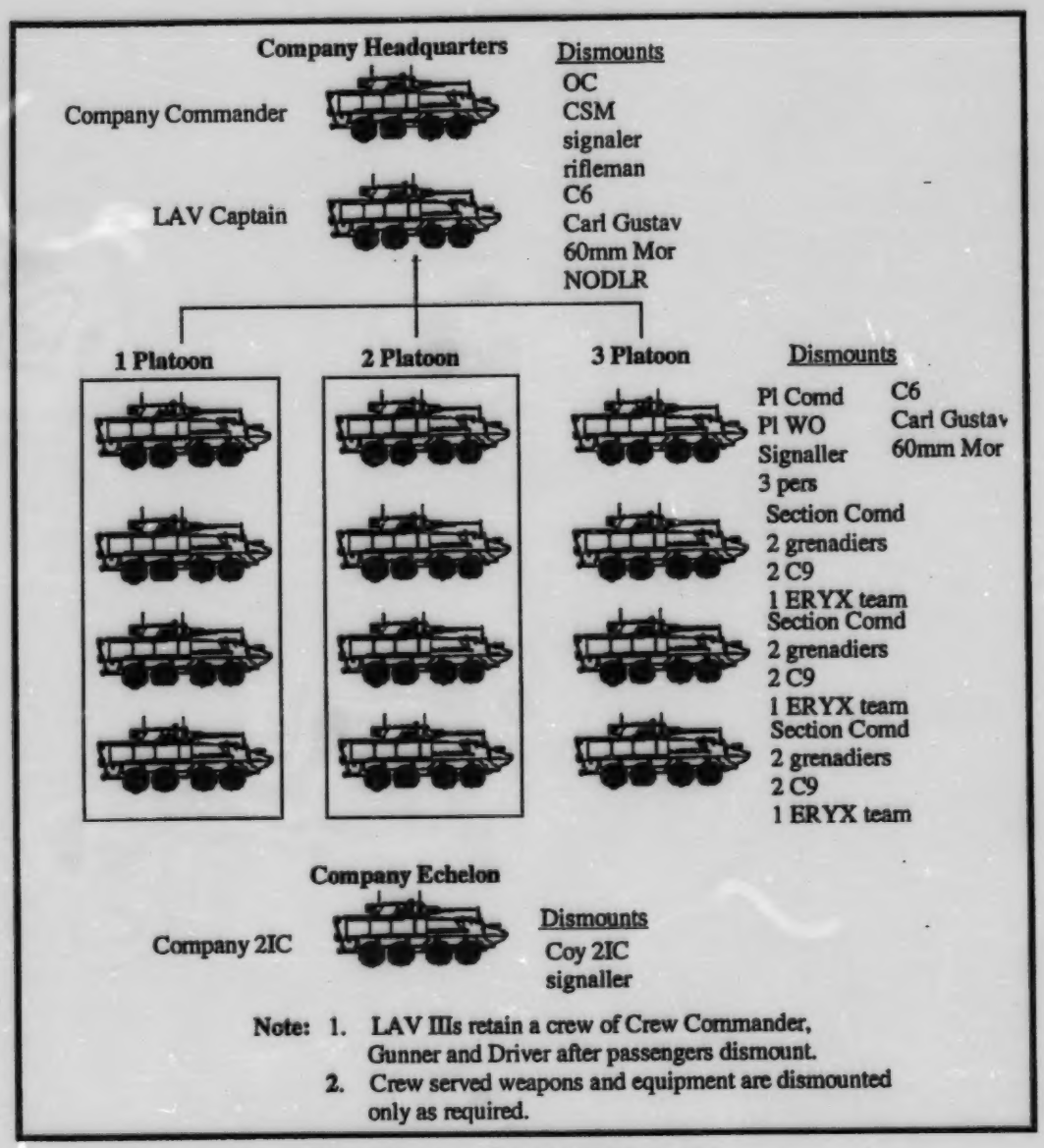


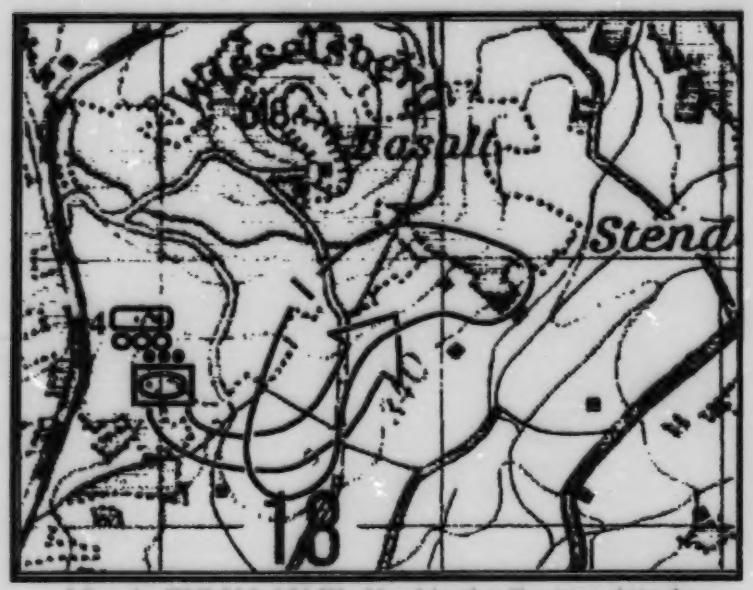
Figure 2: BLUE LAV III Company

28. Basic BLUE Deployment. For the baseline vignette, the BLUE company prepared its defence deploying the empty (ZULU) M113A3s to the rear in hidden platoon ZULU harbours. Platoons were represented as having dismounted three .50 cal heavy machine guns (HMGs), each being deployed with its rifle section. In the LAV III vignette, the LAV IIIs were integrated with their sections on the defensive position. The BLUE deployment is illustrated below in Map 3.

Map 3: BLUE Defence Plan

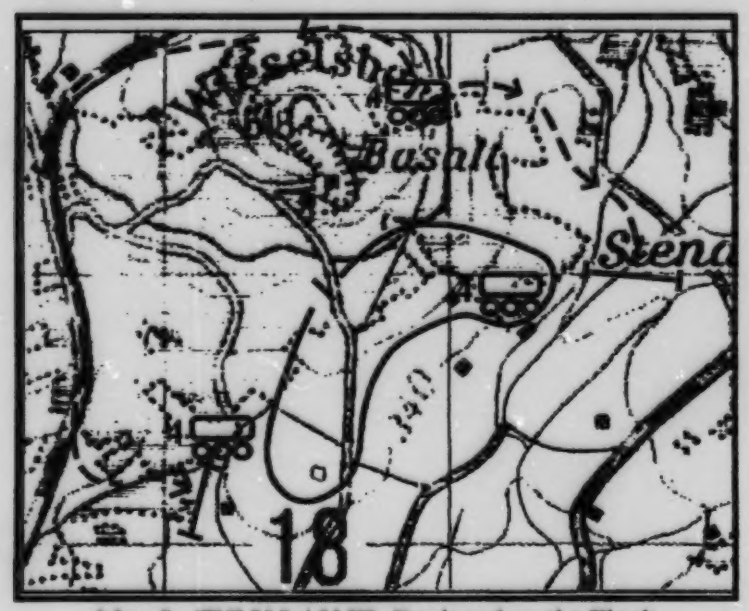
29. Variations on Deployment. In order to meet the study objectives, three variations of the basic BLUE LAV III deployment were gamed. These were:

a. ZULU LAV IIIs Used in the Counter-Attack. In this deployment option, four ZULU LAV IIIs and four Leopard C2s were deployed to the rear of the main defensive position and held in readiness as a local counter-attack force. The LAV IIIs and tanks were deployed in the wood occupied by B Company, WEST of the most Westerly B Company platoon, as shown in Map 4.



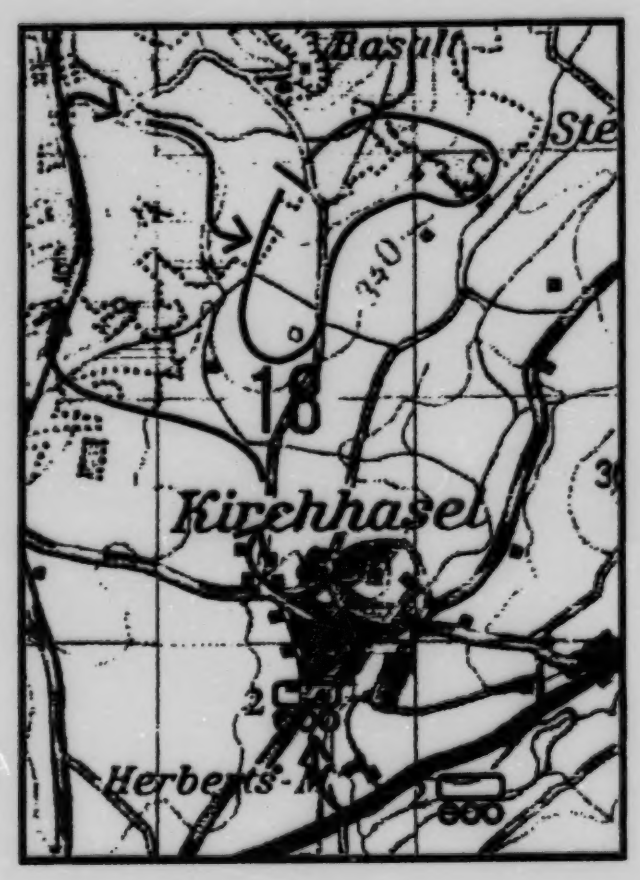
Map 4: ZULU LAV IIIs Used in the Counter-Attack

b. ZULU LAV IIIs Deployed on the Flank. In this deployment option, three platoons of ZULU LAV IIIs were used to fire from the flanks of B Company into the main killing zone. One platoon's vehicles were sited in a position to the WEST of the most Westerly B Company platoon. The second platoon's LAV IIIs were deployed near B Company's EAST boundary. The third platoon's LAV IIIs deployed initially behind the B Company defensive position, tasked to move to the threatened flank once RED's intentions became known, as shown in Map 5.



Map 5: ZULU LAV IIIs Deployed on the Flank

c. ZULU LAV IIIs Deployed Forward. In this deployment option, a platoon's ZULU LAV IIIs were sited forward in the area of KIRCHHASEL and tasked to provide early attrition of RED's recce and to mask the exact location of BLUE's defensive position, as shown in Map 6



Map 6: ZULU LAV IIIs Deployed Forward

RED FORCE STRUCTURE AND CONCEPT OF OPERATIONS

30. In preparing the vignette, the RED feint and supporting attacks were removed. The RED force comprised the 1st and 2nd echelon battalions committed to attack BLUE's B Company. The RED force included 2 ½ T-80U tank companies and five BMP-2-equipped motor rifle companies. The BMP-2s were armed with AT-14 missiles and the T-80Us were capable of firing AT-11 TBMs. A MT-12 anti-tank battery, the equivalent of eight battalions of artillery, the remnants of the regimental recce company and various support platoons armed with AGS-17s, machine guns and AT-14s supported these two battalions. Figures 3 and 4 outline the RED force organization. Map 7 illustrates the detailed RED main attack plan.

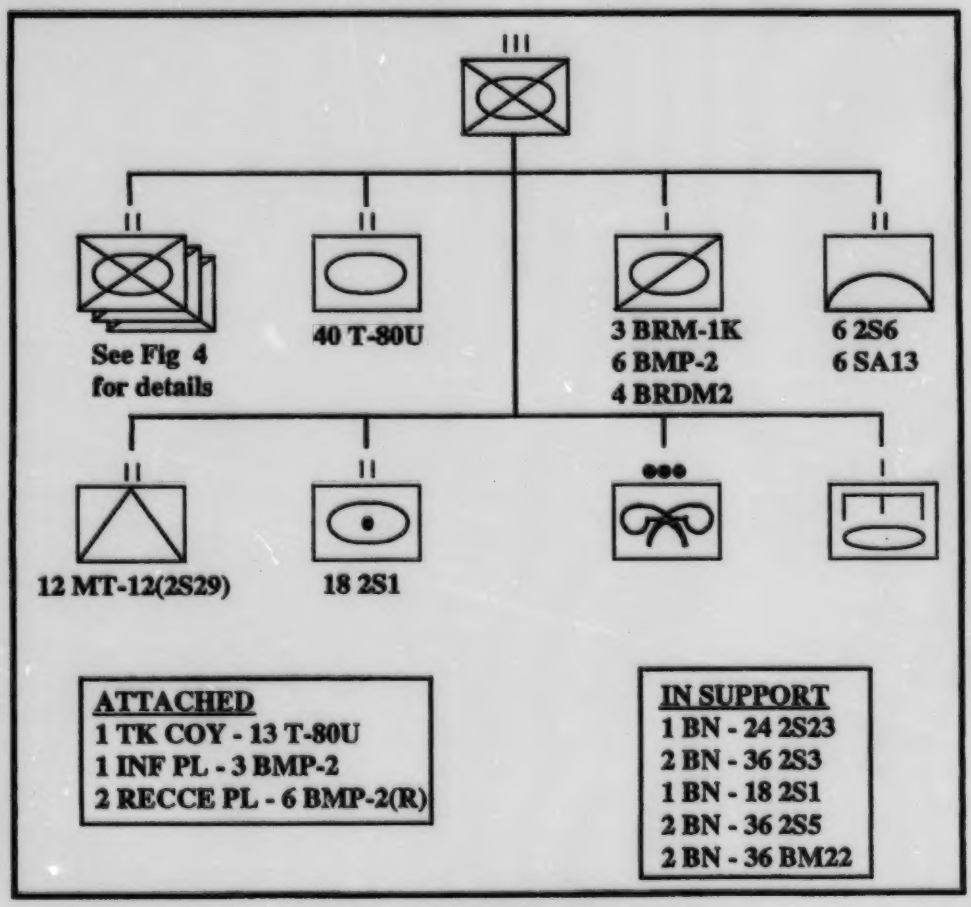


Figure 3: RED MRR in the Attack

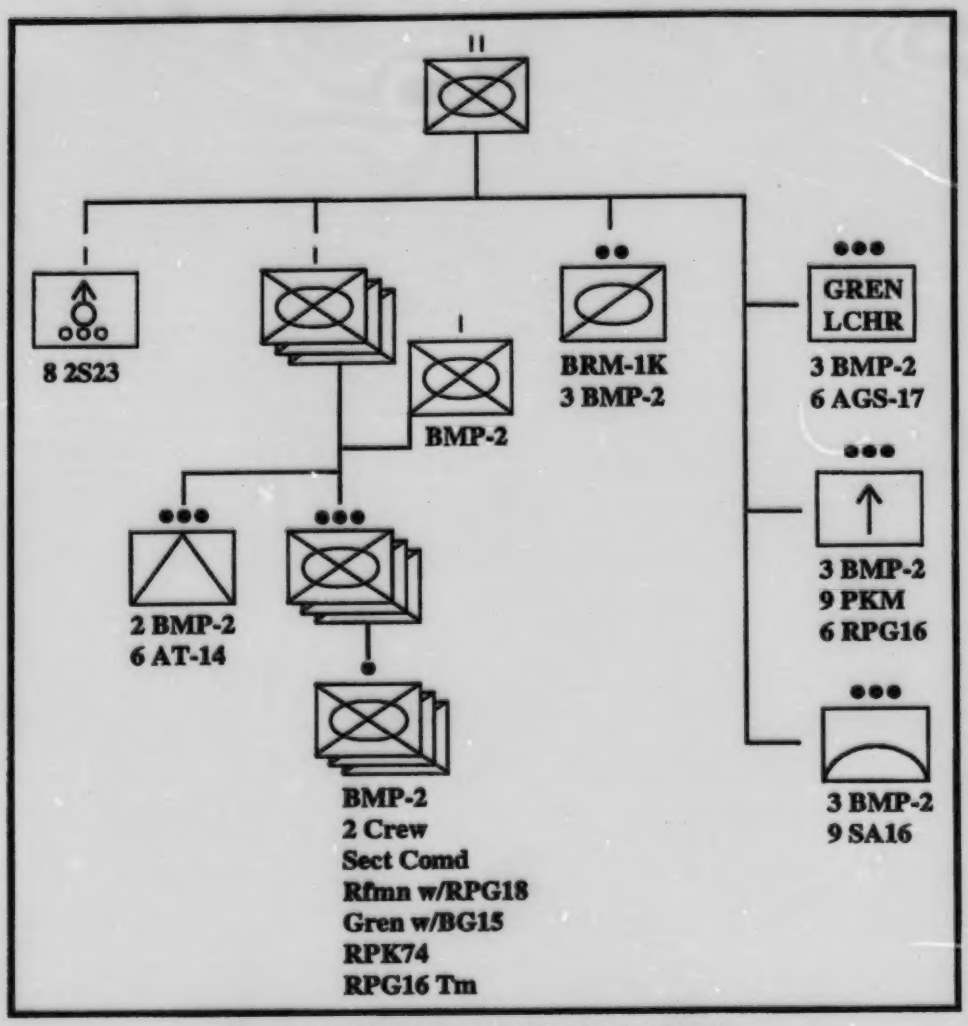


Figure 4: RED MR Battalion in the Attack

Map 7: Detailed RED Attack Plan

GAME HISTORY

M113A3/Dismounted HMG – LAV III On Section Locality

31. Opening Situation – BLUE. The vignette opened with limited BLUE intelligence about the RED force. Three Coyotes were deployed forward in the WEST, centre and EAST covering routes towards the BLUE frontline positions. The tank squadron was deployed in three locations, one troop in a hide in the eastern wooded spine, a troop moving from its hide in the WEST towards the impending RED attack and the rest of the squadron deployed in a

centrally located hide. B Company and the A Company platoon were both deployed with their section APCs near their platoons. The empty M113A3s were deployed to the rear in platoon ZULU harbours in the baseline game. The sections'.50 cal HMG were dismounted and deployed to reinforce the infantry platoon's firepower. In the LAV III vignette, the vehicle was integrated with its section to reinforce the section's firepower. Anti-tank minefields were deployed covering the open ground and the gap in front of and between A and B Companies. A gap existed between the two minefields reflecting that BLUE had run out of time and resources. B Company had prepared low wire entanglements and two small protective anti-tank minefields in front of the platoon covering this gap.

32. Opening Situation – RED. The vignette opened with BLUE having completed his defensive preparations and RED about to launch the main attack against BLUE's B Company. RED's 1st and 2nd echelon battalions were deployed on the roads around HASELSTEIN waiting to move forward. The western firebase element consisting of a machine gun platoon and an AGS-17 platoon was in the rolling ground EAST of HÜNFELD, while the eastern firebase element, consisting of an MT-12 battery and an under-strength tank platoon was in the area of the wooded spine EAST of HASELSTEIN.

33. RED Recce Phase. The battle opened with RED commencing his preparatory bombardment of the A and B Company areas. The targetting of this bombardment was based on intelligence that RED gained early in the battle and his assessment of which terrain features could dominate his approach. During this bombardment, RED moved recce elements forward to further define the situation for the 1st echelon battalion. Since the divisional and regimental recce detachments had been destroyed, RED used the 1st echelon battalion's recce platoon to acquire details of BLUE's deployment, particularly details of what obstacles were deployed in front of B Company. The RED Recce Platoon advanced through the low ground towards KIRCHHASEL and the B Company wood. The remainder of RED's force awaited the results of the bombardment and the recce before committing to battle. The recce platoon was never able to define clearly the extent of BLUE's obstacles or his deployment. In most iterations, the platoon was destroyed in the area of the AM STEIN Spur hill feature EAST of KIRCHHASEL. BLUE's LAV IIIs were useful in the destruction of the RED recce vehicles. Their 25mm cannon was able to fire from the main defensive position and destroy RED's BMP-2s before they were able to close and gather data. With an M113A3-equipped force, BLUE let RED get within range of the M113A3's dismounted .50

cal HMG or BLUE would unmask one or more Leopard C2 tanks to destroy the BMP-2s. Such unmasking was not without risk as RED had artillery observers deployed. They would shell any suspected armoured fighting vehicle (AFV) locations with at least a battalion of howitzers.

34. Movement of RED Firebases. As it became obvious that the recce platoon was going to be unsuccessful, RED started deploying his firebases to support the 1st echelon battalion's attack. The first firebase to move was one deployed in the centre along the NORTH side of the woods EAST of GROβENBACH. This firebase was formed using the AT-14-equipped anti-tank platoons found in each motor rifle company. The WEST and EAST firebases were ordered forward at appropriate intervals to ensure that they were in position when the 1st echelon battalion attacked, without being overly exposed to BLUE's fire. The WEST firebase followed the low ground NORTH to GROβENBACH. From there it followed a defile NORTH into KIRCHHASEL. The EAST firebase moved through the woods to be able to deploy onto the AM STEIN Spur just before the 1st echelon battalion attacked. The WEST firebase was normally destroyed by tank gunfire while moving NORTH in the defile towards KIRCHHASEL. Its remnants sought fire positions in the KIRCHHASEL and GROβENBACH areas. BLUE used his artillery to suppress RED's centre firebase. The EAST firebase was rarely detected until it deployed onto the AM STEIN Spur. While the firebases were moving into position, RED modified his artillery bombardment plan aided by additional intelligence that he had gained on BLUE's deployment. Particular emphasis was placed on known and suspected locations of TUAs and Leopard C2s.

35. BLUE's Reaction. Using the observation afforded by the hill behind B Company, BLUE was able to observe much of RED's preliminary moves. As more RED elements deployed into position, BLUE moved Leopard C2 tank troops into their planned battle positions. These tanks were used to engage priority RED targets such as the WEST firebase. RED generally detected BLUE's tanks moving and engaged them with artillery. RED used Dual Purpose Improved Conventional Munitions (DPICM) from at least a howitzer battalion on each identified tank target. This fire proved to be very effective; in one iteration seven of 19 Leopard C2s were destroyed before RED launched his main attack.

36. 1st Echelon Battalion Attack. While the preliminary firebase deployments and bombardments were occurring, the 1st and 2nd echelon battalions moved NORTH. The 1st echelon battalion sought to reach the low ground SOUTH of the AM STEIN Spur without coming under fire. The 2nd echelon battalion followed along behind seeking a covered hide until required to exploit the success of the 1st echelon's attack. From observation locations, BLUE engaged the 1st echelon before it entered the open ground SOUTH of the AM STEIN Spur. RED's hope of finding a covered attack position was unrealised. The 1st echelon battalion was forced to deploy quickly into attack formation while taking serious losses. The EAST firebase suffered heavily as it deployed its towed anti-tank guns onto the AM STEIN Spur to support the 1st echelon. This battalion was forced by its losses to attack hastily, supported by those elements able to engage BLUE's position. When fighting an M113A3-equipped BLUE force, RED was able to destroy the exposed B Company platoon behind the low wire entanglement, establishing dismounted infantry into the woods. Surviving BLUE tanks and TUA were able to destroy the 1st echelon battalion. When facing the 25mm cannons of the LAV III as well as tanks and TUAs, RED lost his 1st echelon battalion in as little as two minutes. Losses were so severe during one LAV III iteration that RED was not able to launch the 1st echelon attack. Instead, the 1st and 2nd echelons attacked as one force, without success.

37. 2nd Echelon Battalion Attack. While the 1st echelon battalion was attacking, the 2nd echelon battalion attempted to minimize losses while being close at hand to exploit the 1st echelon's success. The ground and limited concealment forced the 2nd echelon to remain close behind the 1st echelon. This resulted in the second battalion taking casualties before the 1st echelon battalion had launched its attack. These losses led RED to launch his 2nd echelon very quickly after the 1st echelon had been committed. In some iterations, the 2nd echelon was launched within two minutes of the 1st echelon. Against the LAV IIIs the 2nd echelon had as little success as the 1st echelon. Each battalion attack was destroyed within minutes. Occasionally, the two battalions got some dismounted infantry into the B Company Wood. RED had greater success against the M113A3-equipped BLUE force; in some iterations RED established a secure lodgement in B Company's position with up to two platoons worth of infantry, tanks, and BMP-2s. In these cases, BLUE had insufficient strength remaining to dislodge RED. However, RED was unable to continue the advance. A BLUE battle group level counter-attack would have been required to dislodge RED. In these iterations, all RED and BLUE sub-units were rendered combat ineffective.

Variations On BLUE Deployment

38. ZULU LAV IIIs Used in the Counter-Attack. Overall the vignette played out similar to the baseline games described above. BLUE was able to destroy RED's attack. This success was made easier if BLUE lost few Leopard C2s and TUAs to RED preparatory fire. The terrain did not prove ideal for the use of a local counter-attack force. The counter-attacking force had limited options for manoeuvre under cover. Neither the Leopard C2s nor the LAV IIIs could manoeuvre in the presence of an enemy equipped with BMP-2s and tanks. In no iteration did the counter-attack force contribute significantly to BLUE's success. In all cases any success was gained at the cost of the quick destruction of the counter-attack force as a fighting element. See Map 4.

39. ZULU LAV IIIs Deployed on the Flank. The general flow of the battle was the same as that described in the baseline scenario. RED's attacks were destroyed, leaving only a small, unsupportable lodgement in the B Company Wood. The terrain was not optimal for the use of ZULU LAV IIIs on the flank. The westerly group of ZULU LAV IIIs had some success firing across into the killing zone. Their contribution did not seem to be any more significant than when they were deployed with their sections, although any artillery fire that they attracted reduced the amount fired onto the main defence position. The depth ZULU LAV IIIs demonstrated clearly the inability of the LAV IIIs to manoeuvre in the presence of the enemy. Whenever these vehicles were detected moving towards their fire positions, they attracted direct and indirect fire resulting in heavy losses (75% in one iteration). See Map 5.

40. ZULU LAV IIIs Deployed Forward. Use of the ZULU LAV IIIs forward did not change the overall flow of the battle. RED was able to obtain a lodgement in the B Company Wood in some iterations, with the 1st and 2nd echelon battalions being destroyed in the effort. Despite the presence of some cover, the ZULU LAV IIIs had great difficulty withdrawing back into the main defensive position. They had some success in disrupting RED's early recce moves. However, when faced by the growing strength of RED's main body, the vehicles could only withdraw or hide. While withdrawing, the forward-deployed LAV IIIs suffered as much as 75% losses resulting from RED direct and indirect fire. Their rearward movement also attracted fire onto other BLUE forces which were passed on the way into and through the defensive position. By remaining concealed in KIRCHHASEL, BLUE avoided some of these losses, but this took the LAV IIIs out of the battle. See Map 6.

Excursions

41. Removal of TBM from Leopard C2s. The loss of the TBM forced BLUE to change the deployment of the Leopard C2s to cater for their reduced effective engagement range. BLUE anticipated that RED would be able to concentrate more T-80Us and BMP-2s closer to the main defensive position before being engaged effectively by BLUE's direct fire. More RED fighting vehicles at shorter range would impose higher demands on the LAV III to perform well. BLUE deployed most of his tanks to cover the gap between A and B Companies. Few were sited to fire from the high ground behind B Company. RED was successful in destroying Leopard C2s and TUAs using direct and indirect fire before launching his two attacking battalions. Despite losses, BLUE was able to destroy RED's attacks, keeping RED out of the B Company Wood. The losses in Leopard C2s and TUAs left the BLUE battle group nearly defenceless against any follow-on RED armoured forces.

42. RED Fire on Detection. The LAV III performance while under increased fire was examined. Allowing the RED attacker to engage any vehicle detected in the objective area using direct fire increased the contribution of RED's firebases, T-80Us, and BMP-2s. It was felt that the following risks to BLUE would be more realistically portrayed:

a. Vehicle movement in the objective area in the face of the enemy; and

b. The BLUE Commander's decision either to delay opening fire (in order to increase the likelihood of kills) or to open fire on recognized targets early (before being neutralized by RED).

The experience of this excursion mirrored those of other iterations. RED took heavy casualties, losing most fighting vehicles from the two battalions. However, RED did achieve greater success than in other vignettes, establishing a lodgement into the B Company wood during one iteration.

JUDGEMENTS AND INSIGHTS

43. General. The BLUE defensive battles demonstrated that the LAV III was a more effective system than the M113A3/HMG combination. The LAV III offered the vehicle crew protection, the ability to see and detect targets through smoke, the ability to fire more effectively on the move (stabilized gun platform) and the ability to engage effectively at

longer ranges. The Leopard C2 with the TBM was the dominant, most effective BLUE system. Without a TBM capability, there was more pressure on Leopard C2s, TUA and LAV IIIs to survive and destroy more RED tanks, BMP-2s and other anti-armour systems at closer ranges. RED's success depended primarily on the number of Leopard C2s destroyed early. If the Leopard C2s were not destroyed, RED could not close onto or near BLUE's position since the Leopard C2s killed the T-80Us at longer, standoff ranges. RED became more reliant on artillery to manoeuvre and to neutralize BLUE.

44. Manoeuvre. Movement or manoeuvre in the main battle position area attracted attention and effective direct and indirect fire from the assaulting force's firebases, the assaulting echelons, and artillery. In all tactical situations that forced the LAV III to manoeuvre, it was quickly neutralized or destroyed;

45. Command and Control. Critical to the success of BLUE's defence were the employment of an effective means of commanding and controlling the ZULU LAV III and integrating its firepower into the defence. There is a requirement for a doctrinal review to establish appropriate guidelines and procedures. Experience during IRON RENAISSANCE recommends the following:

a. When deployed with the infantry platoon, the LAV IIIs should be commanded and controlled by the Platoon Commander or, at his discretion, by the section commanders;

b. When the ZULU LAV IIIs are deployed away from the platoon, it must be clarified whether the Platoon Commander is located with the vehicles or the platoon. It was not felt appropriate for the platoon's LAV Sergeant to be sent by himself with all of the platoon's vehicles;

c. When used for counter-attacks, the LAV IIIs should be controlled by the LAV Captain; and

d. When used on the flanks, the ZULU LAV III force should be controlled by the LAV Captain, who answers to the Company Commander's orders.

46. Siting. When LAV IIIs, which were dug in and camouflaged with their infantry sections, opened fire, they attracted RED's attention and retaliatory direct and indirect fire. Although undetected and unable to influence the battle at this time and at this range, the

entrenched infantry sections and platoons also suffered casualties from this retaliatory fire from RED. Siting the LAV IIIs behind the entrenched infantry could reduce BLUE's casualties on the main position. However, this deployment would reduce the LAV III's maximum effective range forward of the main position. This reduced effective range would improve RED's concentration of force attacking the position and reduce the LAV III's ability to destroy BMP-2s.

47. Section Control. LAV IIIs were best deployed with their sections, in their section localities, dug in and camouflaged. When deployed across the whole frontage of the main defensive position, the LAV IIIs were better concealed (harder to detect), better protected (harder to destroy) and more dispersed (being less concentrated in numbers, the LAV IIIs are less likely to be artillery targets). LAV III firepower was more likely to be available when it was most needed, i.e. when the largest target profile was presented, during the RED assault. However, it was noted that sabot fragments from LAV IIIs firing Armour Piercing, Fin Stabilized, Discarding Sabot (APFSDS) ammuntion would pose a risk to dismounted soldiers deployed in close proximity.

48. Firepower. Infantry sections and platoons dug in on the main defensive position suffered a loss of essential organic firepower when their LAV IIIs were held in reserve in the counter-attack role and when their LAV IIIs were deployed forward or to the flanks, away from the immediate proximity of their sections/platoons.

49. Variations on Defensive Deployment. In every case where ZULU LAV IIIs were employed as a manoeuvre element, they contributed little to BLUE's effectiveness and they were destroyed quickly. It is likely that LAV IIIs would have been more useful if they had been deployed in fire positions from the beginning of the battle.

Noteworthy Comments

50. RED's tanks and BMP-2s were able to neutralize or destroy BLUE's trenches with relative impunity outside the 600m (ERYX) standoff range after BLUE's comparatively few tanks, TUAs and LAV IIIs had been neutralized.

51. RED's dismounted infantry was able to cross BLUE's minefields quickly and was able to ground-guide intimate support tanks through the minefields because anti-personnel mines were not laid in BLUE's anti-tank minefield.

ANALYSIS

Mission Success

52. In this analysis, mission success was judged by considering the following issues:

a. Mission accomplishment was judged by whether RED was able to secure its initial objective; and

b. Mission duration was measured by the time elapsed before BLUE decided to pull out or RED decided to break off.

53. Mission Accomplishment. The LAV III battle group was successful at preventing RED from reaching its initial objective in all runs. The M113A3 battle group was not successful at preventing RED from reaching its initial objective in three of the four runs, however, the RED force was unable to reach its final objective.

54. Mission Duration. In the defence, the average duration for the M113A3 vignette was 32 minutes longer than the LAV III vignette (91 versus 59 minutes). The LAV III vignette ended much sooner because the LAV III battle group was able to destroy RED at medium to long range before the RED infantry was able to dismount and assault the defensive position.

Loss Exchange Ratio (LER)

55. LER provides an overall measure of the effectiveness of a force because it accounts for both the losses and kills of a force. LER indicates the number of RED systems killed per BLUE loss. The higher the LER, the more favourable it is for BLUE. For example, if BLUE lost two systems and RED lost eight systems, BLUE would have an LER of four.

56. In order to focus on the main objective, which is to compare the M113A3 and LAV III, analysis of RED and BLUE losses were limited to those systems which were considered high-value or "key". Key systems were chosen based on their contribution to the total kills by the force. For example, if the BMP-2 was responsible for 25% of the kills achieved by RED it would be considered a key system, whereas if the BMP-2 was only responsible for 2% of RED kills, it would not be considered a key system. For RED, the key systems were the T-80U and the BMP-2. The key systems for BLUE were the Leopard C2, LAV III, dismounted .50 cal HMG, TUA, and the ERYX. The seven .50 cal HMGs that remained mounted on ZULU M113A3s were not considered key systems, therefore, the M113A3 battle group had 52 key systems while the LAV III battle group had 59.

57. The LER for the M113A3 and LAV III battle groups are summarized in Figure 5. The results indicate that the LAV III battle group suffered only 2/3 the losses (26.3 vs 40.0) and achieved an LER that was 1.6 times that of the M113A3 battle group (3.5 vs 2.2). If all systems are considered, including mounted infantry in armoured personnel carriers, the LAV III battle group achieved an LER that was twice that of the M113A3 battle group (10.3 vs 5.1). This emphasizes one of the big advantages of the LAV III. Specifically, the LAV III is able to engage and defeat RED's APCs at a longer range before the RED infantry have dismounted and dispersed.

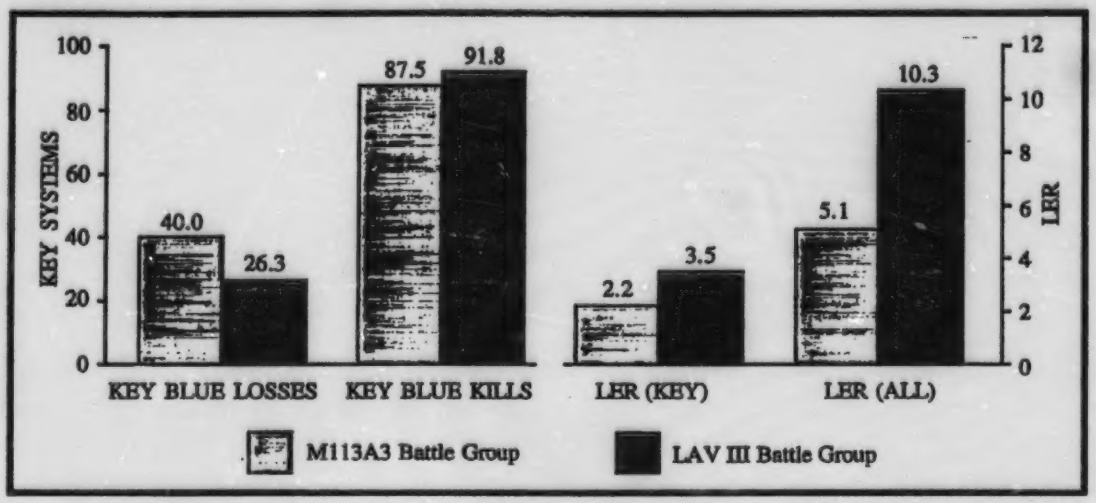


Figure 5: LER of M113A3/LAV III Battle Groups in the Defence

Residual Combat Strength

58. In terms of total number of key systems, the M113A3 battle group lost 40.0 of its 52 key systems (77%) while the LAV III battle group lost 26.3 of its 59 key systems (45%). Although all 21 M113A3s were in ZULU harbour and not considered key systems in this vignette, four M113A3s were lost to indirect fire. The M113A3 battle group, having lost so many key systems, would have difficulty reconstituting let alone accepting follow-on tasks. The LAV III battle group was judged to be able to reconstitute and defend itself, but could not accept a subsequent task without reinforcement.

Lethality

59. Figure 6 shows the contribution of BLUE systems to key RED losses. The results indicate that the Leopard C2 was the major contributor for both the M113A3 and LAV III battle groups accounting for roughly 50% of all kills. The dismounted .50 cal HMG and the LAV III were the next most significant contributor to their battle groups, however, the LAV III's contribution was 3.0 times that of the HMG (33.3 vs 11.3). The figure also shows that the LAV III battle group was able to destroy RED at medium to long range with the Leopard C2s and LAV IIIs while the M113A3 battle group relied more heavily on short range weapon systems such as mines and ERYX to defeat the enemy

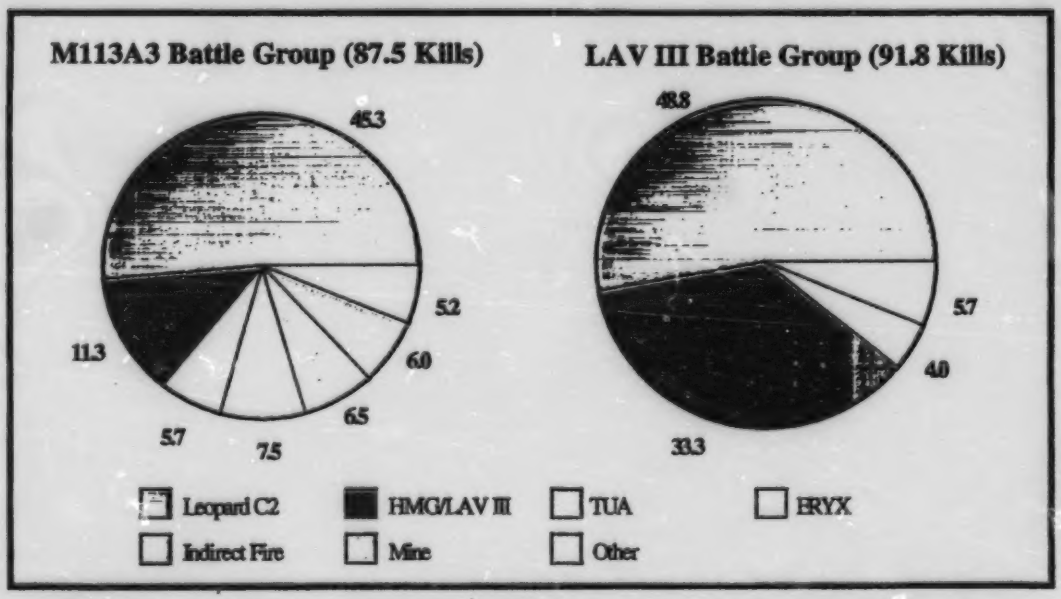


Figure 6: Contribution of BLUE Systems to key RED Losses in the Defence

60. Figure 7 illustrates the breakdown of the M113A3/LAV III kills of all RED systems. The LAV III kills 3.0 times as many BMP-2s as the dismounted HMG of the M113A3 (33.3 vs 11.3) and it does so at 2.2 times the range (1.7 vs 0.8 km). If mounted infantry in APCs are considered, the LAV III was responsible for 3.0 times as many kills (212.8 vs 72.5).

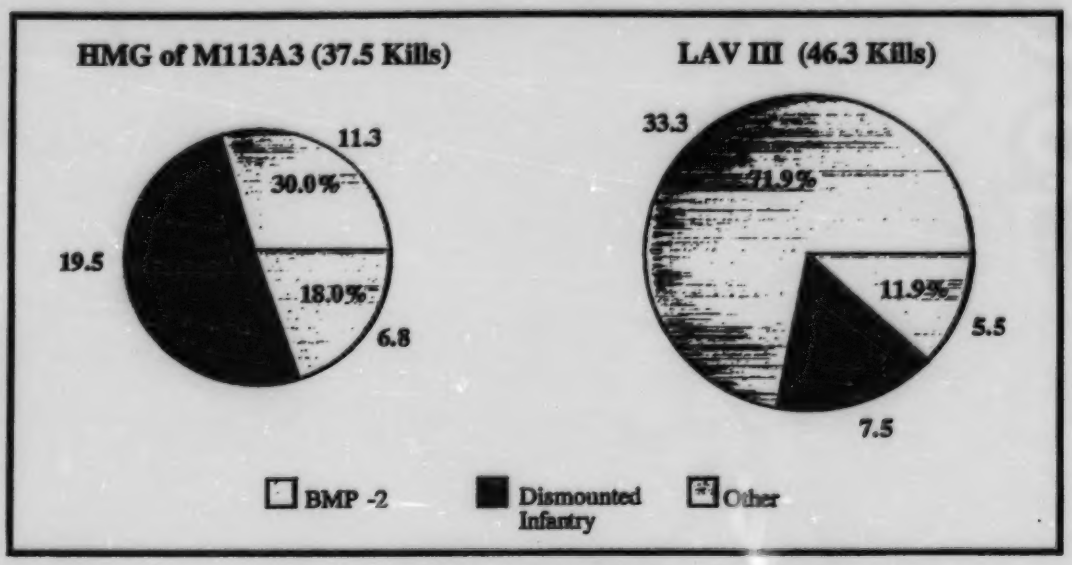


Figure 7: HMG/LAV III Kills in the Defence

Survivability

61. Figure 8 shows the contribution of RED systems to BLUE losses. The LAV III battle group suffered only 2/3 the losses as the M113A3 battle group, but the losses were proportionally attributable to the same sources. The higher proportion of indirect fire losses to the LAV III battle group (34.6% vs 26.3%) was attributable to RED's tactic of engaging any detected AFV with a battalion of artillery.

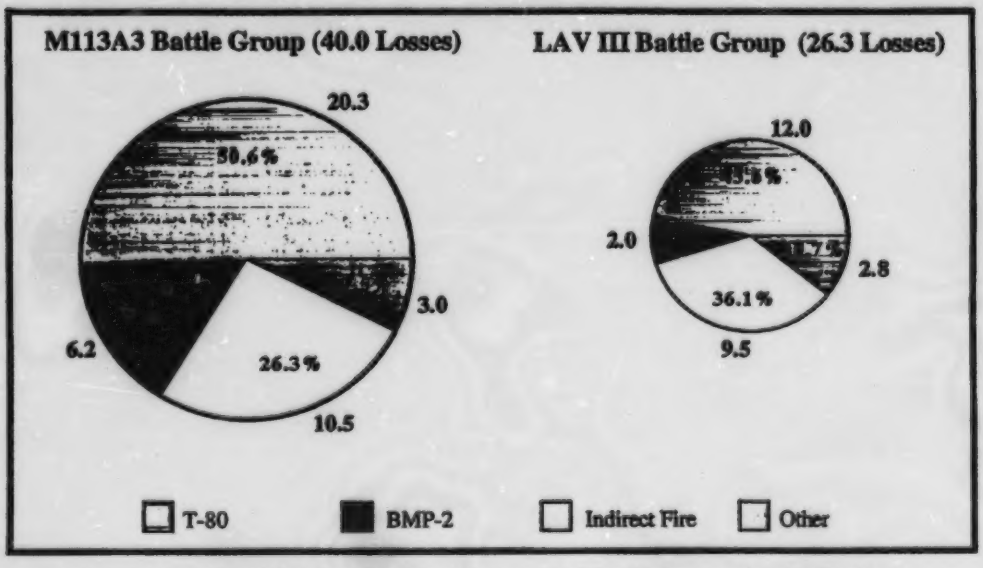


Figure 8: Contribution of RED Systems to BLUE Losses in the Defence

62. The contribution of RED systems to HMG/LAV III losses is shown in Table 1. Overall, the number of losses is comparable (9.0 vs 8.5). The T-80U was the major contributor to HMG losses, while indirect fire was the major contributor to LAV III losses.

Table 1
Distribution of HMG/LAV III Losses to RED Systems in the Defence

	Total Losses	RED System			
		T-80U	BMP-2	Artillery	Other
M113A3's Dismounted HMG	9.0	5.5	1.5	2.0	0.0
LAV III	8.5	3.3	0.5	4.5	0.2

VARIATIONS ON DEFENSIVE DEPLOYMENT

63. The results of varying the deployment options of the LAV IIIs are listed in order of LER effectiveness in Table 2. The table reveals that the variation in deployment had little overall effect on kills of key RED systems but had a significant effect on the number of key BLUE losses. Siting and digging in LAV IIIs on the position proved to be the most effective deployment in reducing the number of key BLUE losses and yielded the best LER for the battle group. The other deployments resulted in increases of key BLUE losses from 20% to 45%.

Table 2

LAV III Battle Group Performance Using Different Deployments in the Defence

LAV III Deployment Option	Battle Group			LAV III Company		
	Key BLUE Losses	Key RED Losses	LER	Losses	BMP-2 Kills	LER
On Position	26.3	91.8	3.5	8.5	33.3	3.9
Counter-attack	31.5	95.5	3.0	10.3	31.3	3.0
Flank	32.3	87.8	2.7	12.0	27.3	2.3
Forward	38.0	94.0	2.5	14.0	30.3	2.2

64. Analysis of the effectiveness of the LAV III company revealed a similar trend to that of the battle group. When dug in on the position, the LAV IIIs in the infantry company were the most effective. It achieved the greatest number of BMP-2 kills and suffered the fewest losses.

65. Table 3 compares the effectiveness of the LAV III platoon that was required to manoeuvre in the different deployment options to that of the same platoon dug in on the position. The results indicate that the LAV III was ineffective when required to move. It cannot manoeuvre in the presence of the enemy. Except for the forward deployment where the LAV IIIs were able to ambush the leading elements of RED, the platoon required to move contributed little to BMP-2 kills and was almost always destroyed.

Table 3

Performance of LAV III Platoon Forced to Manoeuvre

LAV III Deployment Option	LAV III Platoon		
	BMP-2 Kills	LAV III Losses	LER
On Position	10.0	1.8	5.7
Counter-attack	0.5	2.8	0.2
Flank	1.5	3.8	0.4
Forward	5.0	3.8	1.4

EXCURSIONS

66. Using the most effective LAV III deployment, dug in on the position, as the baseline, two additional vignettes were gamed to determine the effect on the defence if it was exposed to more RED fire and if the TBM was removed from BLUE. The results of the games are shown in Table 4 and are explained below.

Table 4
LAV III Performance in the Defence Excursions

Excursion	Battle Group			LAV III Company		
	Key BLUE Losses	Key RED Losses	LER	LAV III Losses	BMP-2 Kills	LER
Baseline (LAV III On Position)	26.3	91.8	3.5	8.5	33.3	3.9
RED Allowed to Fire On Detection	46.7	86.7	1.9	15.7	29.7	1.9
No BLUE TBM	39.3	85.0	2.2	12.7	36.3	2.9

Allowing RED to Fire on Detection

67. The more concentrated fire from RED in this vignette resulted in much higher losses for BLUE which suffered 1.8 times the losses of the baseline vignette. BLUE lost virtually all of its Leopard C2s and TUAs and was essentially destroyed as a fighting force. Despite RED's success at destroying BLUE, RED took heavy losses and was also destroyed as a fighting force. RED was more successful in reaching the initial objective but was unable to continue to the next objective because of the losses sustained. Even by improving RED's fire support in the assault with a corresponding increase in BLUE casualties, the LAV III demonstrated that it was still an effective BMP-2 killer achieving an LER of 1.9.

Removing BLUE's TBM

68. Removing BLUE's TBM had the same effect as increasing RED's firepower. BLUE suffered 1.5 times the losses compared to the baseline vignette and lost virtually all of its Leopard C2s and TUAs. RED was also destroyed as a fighting force and was unable to continue the attack beyond the initial objective because of the losses suffered. Removing BLUE's TBM allowed more key RED systems to concentrate in closer proximity to BLUE's defensive position. This resulted in the Leopard C2 squadron losing four more tanks (16 vs 12) and inflicting 25% less casualties on RED (36.3 vs 48.8). At the same time, the LAV III company lost four more LAV IIIs (12.7 vs 8.5) yet inflicted 10% more casualties on RED (36.3 vs 33.3) compared to the baseline game. These results demonstrate that, even when faced with increased threats, the LAV III dug in on the position performed effectively against BMP-2s where it achieved an LER of 2.9.

SUMMARY

69. Both the LAV III and M113A3 battle groups were successful at defending the position, however, the LAV III was superior to the M113A3. The range of its 25mm cannon allowed it to engage and destroy RED's BMP-2s before the infantry could dismount and attack the defensive position. This forced RED to break off the attack much sooner than in the M113A3 vignette and resulted in BLUE suffering only 2/3 the losses and achieving 1.6 times the LER. The LAV IIIs in the infantry company were responsible for killing three times the number of BMP-2s as the .50 cal HMG of the M113A3 company, while losses of entrenched .50 cal HMG and LAV IIIs were comparable.

70. Analysis of defensive deployment options clearly demonstrated that the LAV III was most effective when dug in on the position as an integral part of the infantry company. It was very vulnerable when exposed and could not manoeuvre in the presence of the enemy. Briefly stated, the relative merits and disadvantages of each deployment option are summarized below:

a. Dug in on the Position. LAV IIIs were best deployed dug in and camouflaged with their sections. When deployed across the whole frontage of the main defensive position, the LAV IIIs were better concealed, more dispersed, and better protected. By being less

concentrated in numbers, the LAV IIIs were less likely to be neutralized by RED's direct and indirect fire at the same time. LAV III firepower was more likely to be available at maximum effective range forward of BLUE's main defensive position when it was most needed - during RED's assault. However, it was noted that sabot fragments from LAV IIIs firing APFSDS ammuntion would pose a risk to dismounted soldiers deployed in close proximity.

b. LAV IIIs in the Counter-attack. Deploying LAV IIIs to the rear in a hide, reserved for counter-attack tasks, deprived BLUE of substantial firepower during RED's attacks. Due to the mobility and protection limitations of the LAV IIIs, they could not manoeuvre and survive in the face of RED's direct and indirect fire when brought forward. In every iteration, all LAV IIIs in the counter-attack force contributed little to RED casualties and were quickly destroyed.

c. Sited on the Flank. Benefits to siting LAV IIIs on the flank(s) include not compromising the location of the infantry's entrenchments and being able to engage RED's BMP-2s at maximum effective range forward of the main defensive position. However, the LAV IIIs lacked the area to disperse, site, and conceal themselves effectively compared to being dug in on the position. The LAV IIIs were quickly neutralized or destroyed by RED's direct or indirect fire soon after a LAV III or nearby Leopard C2 or TUA had been detected due to their close proximity.

d. Sited Forward. Although the LAV IIIs may mask the exact location of the main defensive position and inflict some casualties on RED by ambush during the early stages of the battle, it was found that the LAV IIIs were detected quickly and were not able to withdraw successfully, thereby decreasing BLUE's available firepower when needed during RED's attack on the main defensive position. The BLUE commander assumes the risk that the force to be ambushed by the LAV IIIs does not include tanks.

e. Sited Behind. It was judged that LAV IIIs sited behind the main defensive position would not be as effective as integrating them dug in on the position. Although not compromising the location of the main defensive position when sited behind, the LAV IIIs would lack the area to disperse, site, and conceal themselves effectively (similar to the flank option). Siting LAV IIIs behind the main defensive position reduced the effective range forward of BLUE's entrenchments at which the BMP-2 could be engaged. As a result, there would be an increased risk that more RED forces would be available closer to the main defensive position before being engaged. More RED forces would be available to assault the main defensive position, particularly by dismounted infantry from the BMP-2s. Furthermore, reducing the LAV III's effective range forward of the main defensive position would increase the likelihood that the LAV IIIs would be engaged by RED's direct or indirect fire before they would be able to effectively open fire.

71. The vulnerability of the exposed LAV III and its firepower limitations indicate that the LAV III should not be employed as an infantry fighting vehicle (IFV) because:

a. The mobility of a wheeled vehicle restricts its flexibility to manoeuvre and to adapt to current battlefield situations;

b. It does not have the protection to allow it to manoeuvre in the presence of the enemy; and

c. It lacks an anti-tank capability.

72. When the LAV III infantry company was dug in and subjected to a higher concentration of RED firepower or supported by tanks without TBM, the LAV III continued to perform effectively against BMP-2s achieving an LER of 1.9 and 2.9 respectively. In the vignette where BLUE's TBM was removed, the LAV IIIs destroyed 10% more BMP-2s despite suffering 50% more LAV III losses compared to the baseline.

ADVANCE AND QUICK ATTACK VIGNETTE

BLUE Force Structure and Concept of Operations

73. BLUE started the vignette with A Company combat team deployed in advance-to-contact formation in open ground 8km SOUTH of its objective. Four TUAs from C Company, which were moving on A Company's WEST, were included in the vignette as they were able to support A Company's attack. These TUAs started the vignette deployed 2km WEST from A Company. The battle group's mortar platoon and four batteries of M109A4s were deployed in positions capable of providing fire support to A Company. The remainder of the BLUE battle group was removed from the vignette. A Company was equipped with Leopard C2 tanks from the battle group's attached squadron, LAV III or M113A3 APCs for its infantry, and Coyotes for its battalion recce detachments. The structure of BLUE's force is shown at Figure 9. BLUE intended to advance NORTH preceded by recce and then launch a right-flanking attack with tanks and all of A Company against the RED position. This attack would be supported by a troop of tanks and all the TUAs (Map 8). It would be preceded by preparatory bombardment and artillery quick fire plan. As discussed in References 4 and 5, the infantry would be gamed in different iterations of the vignette, dismounting on and before the objective. Their M113A3s or LAV IIIs would then follow them onto the objective providing intimate support to the company.

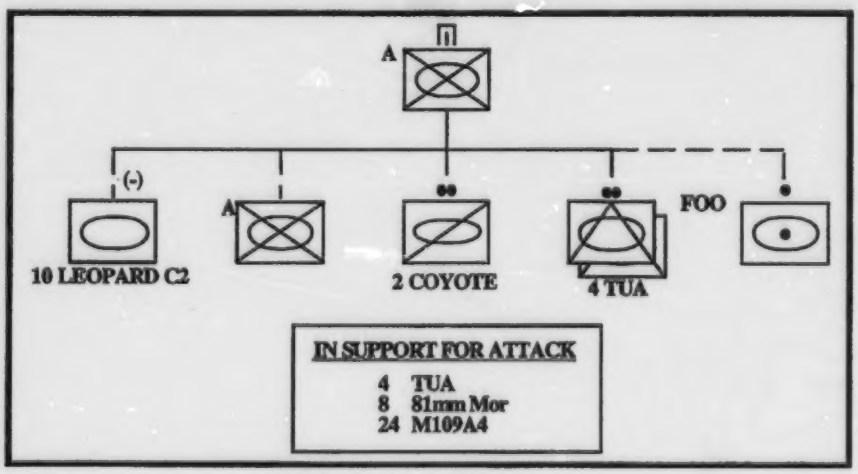
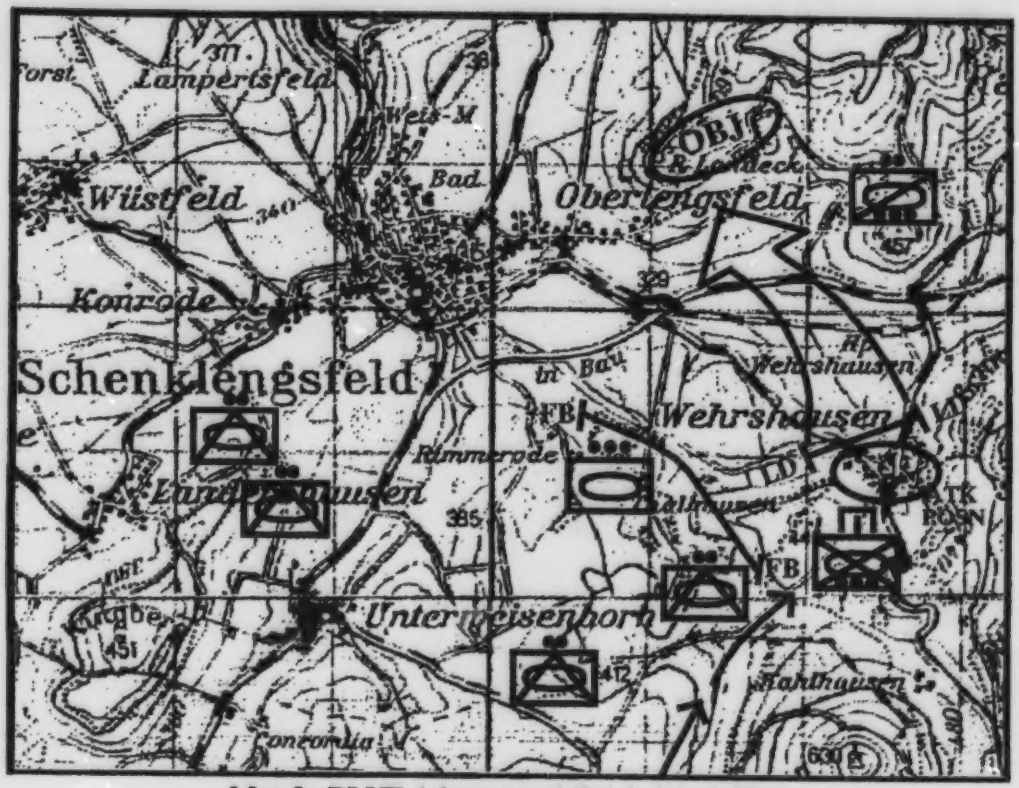


Figure 9: BLUE Force Structure in the Attack



Map 8: BLUE Advance and Quick Attack Plan

74. Variations of Attack. Two variations of BLUE's basic attack plan were also gamed. These were:

a. ZULU LAV IIIs Acted as Near Firebase. In this deployment option the ZULU LAV IIIs dismounted their infantry and then redeployed to the flank of the objective to provide fire support to the dismounted infantry as it assaulted and fought its way through the objective.

b. BLUE Used a Single Platoon of Infantry to Assault Objective. In this deployment option, BLUE used only one infantry platoon to attack the objective, supported by the remainder of the combat team. This vignette investigated the hypothesis that the LAV III's increased firepower would permit fewer infantry to be used to attack an objective.

RED Force Structure and Concept of Operations

75. In this vignette, the RED force comprised a platoon strongpoint supported by tanks. The platoon commander had access to a significant weight of artillery as RED planned to use artillery to impose delay on BLUE's advance, giving the RED main force a chance to establish a coherent defensive position further NORTH. The RED force consisted of a tank platoon (-) of two T-80Us, a platoon (-) of infantry with two BMP-2s and an AT-14 detachment from the company anti-tank platoon. An artillery observer was on the position to direct the fire of a battalion of 2S1 howitzers and a platoon of the parent motor rifle battalion's mortar company. The BMP-2s were armed with AT-14 missiles. The entire RED force was entrenched in a single defensive position. It depended on higher echelons of the RED force for information about BLUE's advance. Figure 10 provides details of RED force while Map 9 shows its deployment.

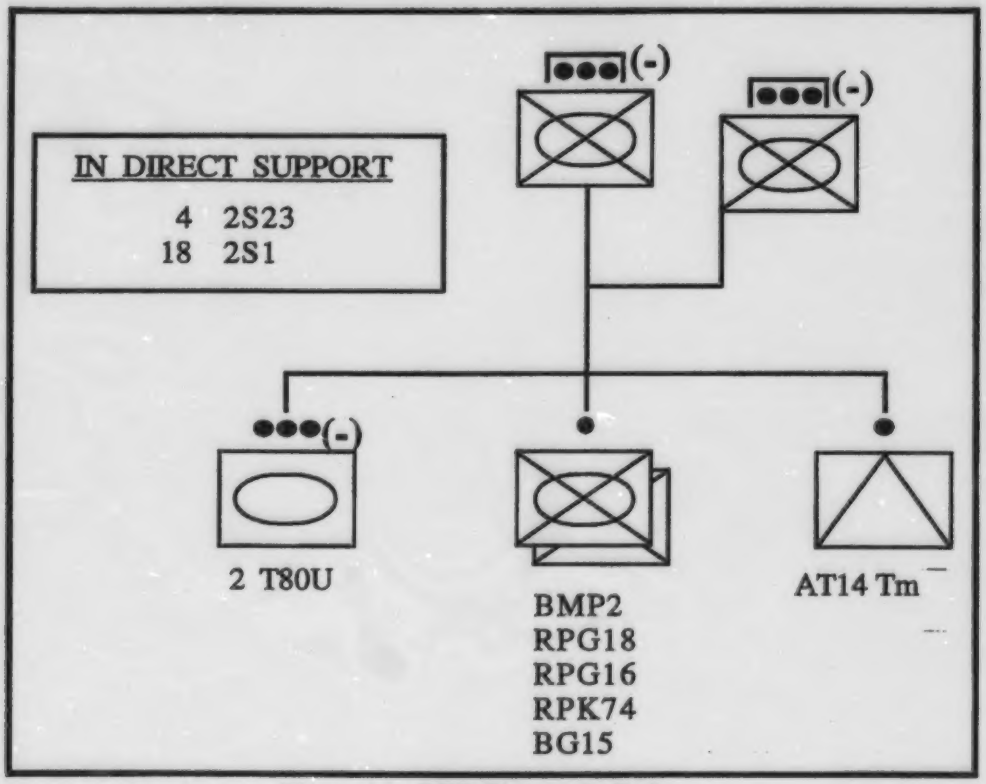
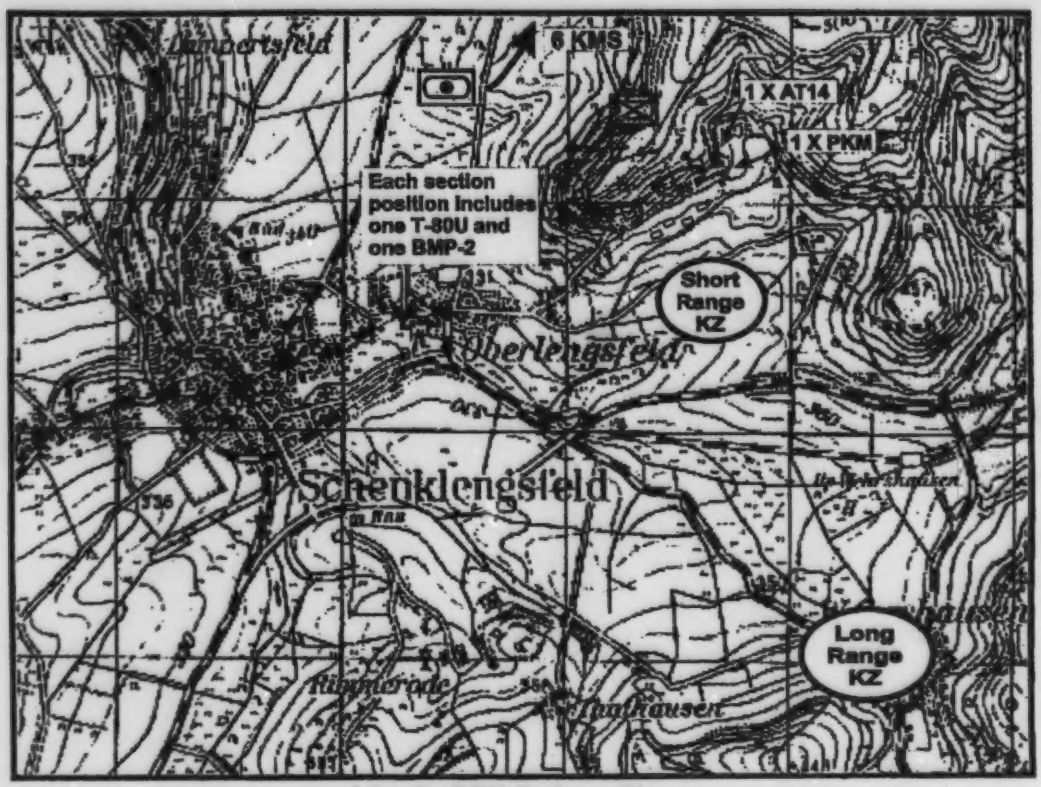


Figure 10. RED Platoon In Defence



Map 9: RED Defence Plan

GAME HISTORY

ZULU M113A3/LAV III Used In Intimate Support of Company

76. Opening Situation/Plan – BLUE. The vignette opened with limited BLUE intelligence about the RED force. BLUE had detected some digging in the woods that constituted the objective. BLUE advanced with Coyotes leading, supported by TUAs, which were followed a tactical bound behind by the tank squadron (-), and then A Company itself another tactical bound behind. The combat team's echelon remained to the rear. Elements of C Company advanced in parallel with the TUAs in A Company. Based on available intelligence and considering the importance of clearing A Company's objective before the rest of the battle group advanced, BLUE started preparatory fire on the objective as recce came within sight of it.

77. Opening Situation/Plan – RED. RED had little intelligence about BLUE's situation and intentions. RED's forces were dug-in with all-around defence. All AFVs were sited in turret-down positions. RED entrenched his infantry in the scrub on the hillside, leaving a

dummy section position on the forward edge of a finger treeline. RED's artillery observer was well sited to cover the approaches.

78. Advance of BLUE's Recce. The conduct of BLUE's advance and attack remained unchanged regardless of whether BLUE was equipped with the LAV III or M113A3 and whether his infantry would dismount on or before the objective. As the leading elements of BLUE's force came within sight of the objective, RED tried to commence attrition early. Key BLUE systems, such as TUAs and tanks, were engaged with artillery if they remained stationary for any prolonged period of time. RED engaged some AFVs with direct fire. The BLUE recce detachments manoeuvred forward using cover to observe the objective. TUAs supported the recce patrol from the wooded hill SOUTH of the objective in the area of THALHAUSEN. The recce patrol paused near the village of WEHRSHAUSEN before crossing the open ground to the NORTH and advancing into the woods of the KREUZBERG feature. RED tried to kill these vehicles with long-range anti-tank guided missile (ATGM) fire. Once in the KREUZBERG, the Coyotes followed covered routes to establish observation of the objective. RED tried to destroy them with indirect or direct fire.

79. Advance of BLUE Main Body. Based on the information received from his recce detachment, TUAs and artillery observer near THALHAUSEN, BLUE was able to direct the full weight of his available artillery and mortars onto the objective. This fire included preparatory fire to start the attrition of RED, a smoke screen to protect the attacking force while it crossed the open ground, covering fire during the advance from the Line of Departure to the objective, and continued fire on depth portions of the objective while the dismounted infantry fought their way forward. While the recce and TUAs were advancing and the quick artillery fire plan was being prepared, the bulk of the A Company combat team continued its approach. A troop of four Leopard C2s joined the TUAs on the THALHAUSEN feature as the supporting firebase. The remaining six tanks and the entire infantry company advanced using covered routes to an attack position in WEHRSHAUSEN. RED normally detected the attack force and engaged BLUE's attack position with artillery fire. This caused few vehicle casualties, but routinely killed a larger number of APC crew commander/gunners in the M113A3 iterations. BLUE had similar success with his artillery fire on the objective, frequently destroying one or more vehicles and several trenches.

80. Conduct of BLUE Attack. As soon as BLUE's smoke screen became effective, he launched his attack force across the open ground towards the objective. As the BLUE force advanced, RED opened fire with his vehicles and infantry at appropriate ranges. This defensive fire normally inflicted heavy losses on the attacking force. Frequently, the AT-14 and RED's AFVs inflicted such losses that BLUE was hard pressed to carry on with his attack. In one iteration, the attacking force was routed before reaching the objective, escaping with only one Leopard C2, three M113A3s and some infantry. The firebase and the Leopard C2s and APCs of the assaulting force engaged any detected RED targets. On reaching the dismount line, either on or before where BLUE perceived RED's position to be, BLUE dismounted his infantry and pressed forward towards the objective on foot, supported by the ZULU APCs in intimate support. RED engaged with more entrenched infantry as BLUE came into effective range. BLUE continued to return fire as targets became exposed. The forward dummy trenches were useful in distracting BLUE.

81. Fight on the Objective. As RED's force was destroyed and the BLUE infantry fought their way through the objective, RED reacted by firing artillery immediately forward of his own position, in the open gap between his entrenchments and the dummy position. This fire was controlled by an artillery observer and caused many BLUE infantry casualties. In some iterations, nearly all the dismounted infantry were killed, many if not most by artillery fire. BLUE quickly learned to remount his assaulting infantry into their APCs as soon as no significant enemy force was detected on the objective. BLUE did not try to clear the objective in detail with his assaulting forces. The plan was to kill RED quickly with his infantry and intimate support APCs and tanks, remount and then reorganize off the objective before RED's artillery landed. For support, the BLUE firebase was used aggressively to come forward as intimate support tanks whenever the attacking force lost an appreciable number of tanks and/or the infantry were hidden from view in the scrub on the objective. The tanks were able to detect many of RED's trenches and destroy them with coaxial machine gun and 105mm HESH fire. The LAV III was also able to provide effective intimate support, being able to detect and destroy RED's trenches with its cannon and machine gun. However the M113A3 was less effective. In one iteration, only three M113A3s were destroyed but a total of 12 crew commanders were killed, one by direct fire and 11 by indirect fire. Little supporting fire was supplied by the M113A3s. Each iteration was stopped when BLUE's surviving APCs had departed the objective. RED lost all of his vehicles and most of his entrenched soldiers in every iteration.

82. Summary of Basic LAV III/M113A3 Iterations. Except for one iteration, BLUE was always successful in his attack. RED's force was reduced to, at most, a few entrenched soldiers. BLUE lost heavily in most attacks. The key factors in these losses and BLUE's degree of success were:

a. Whether RED's AT-14 was able to survive long enough to fire all of its missiles;

b. The effectiveness of the AT-14 detachment's fire;

c. The early destruction of RED's T-80Us and BMP-2s; and

d. The speed with which BLUE could neutralize and overcome RED's defensive position, and quickly remount the assaulting infantry into their vehicles for protection against RED's artillery fire.

Conduct Of Variations Of BLUE's Attack

83. The two variations in BLUE's attack played similar to the basic LAV III/M113A3 iterations. The results of these iterations are given below.

84. ZULU LAV IIIs Acted as Near Firebase. Having the LAV IIIs deploy to the flank after dismounting their infantry did not provide any advantage. The LAV IIIs were forced to move away from the objective to the flanks. This positioned the LAV IIIs further away from the enemy and at a more oblique angle, degrading their ability to observe and fire on RED's trenches. The increased separation between infantry and their carrier vehicles also meant that there was a greater time delay when BLUE decided to remount his infantry. This resulted in more exposure to RED's artillery fire and more BLUE casualties being suffered.

85. BLUE Used a Single Platoon of Infantry to Assault Objective. Using only one platoon to attack a dug-in platoon proved disastrous for BLUE. The attacking force was normally destroyed, losing between seven and ten of its assaulting ten vehicles. RED usually lost most or all of his AFVs and some entrenched infantry repelling the attack. BLUE was unable to get a dismounted infantry force near the objective. In some iterations, most of the entrenched RED infantry were never engaged.

Excursions

86. Removal of TBM from Leopard C2s. The conduct of this vignette played out similarly to the basic LAV III/M113A3 vignette. BLUE was successful in every iteration, suffering differing levels of losses. The removal of the Leopard C2's TBM forced BLUE to move his tanks closer to the objective to engage RED effectively. The ground provided BLUE with suitable fire positions.

87. BLUE Fire on Detection. This vignette played out similarly to the basic LAV III/ M113A3 vignette. BLUE was successful in every iteration, but suffered differing levels of losses. The superior optics on BLUE's tanks routinely caused him to recognize or identify targets immediately upon initial detection. Thus, BLUE got little benefit from firing on detection.

88. Tighter Fire Control for BLUE Firebase. BLUE's losses were generally higher in this vignette than in the baseline vignette, but this had little to do with the fact that the firebase could inflict fratricide on the attacking force. Losses were very much dependent on how soon RED lost his key anti-tank systems and the effectiveness of RED's fire. BLUE chose to halt the fire of its firebase earlier placing the full onus on the assaulting force as they arrived at the objective area. However, the RED force had generally suffered such losses by this time that the attack force was able to destroy all vehicles and trenches that it could find. RED's artillery punished BLUE's infantry severely, causing BLUE to remount early. There were occasions when fratricide occurred when the firebase was permitted to continue firing at targets of opportunity in the objective area while the assaulting force was fighting through the objective. This highlighted the need for tight fire control and co-ordination between the firebase and the attacking force.

89. Removal of TBM from Leopard C2s and Tighter Fire Control for BLUE Firebase. This vignette had very similar results to the previous vignette. The changed parameters did not seem to make any real difference to the results. Fratricide did not occur during this vignette due to tight fire control by the BLUE Commander.

JUDGEMENTS AND INSIGHTS

90. The J&I for the Defensive Vignette were supported by the playing of the Advance and Quick Attack Vignette. The J&I were:

a. Manoeuvre. Movement or manoeuvre in the face of the enemy attracts attention and effective fire (direct and indirect);

b. Command and Control. Critical to BLUE's success were the employment of an effective means of commanding and controlling the ZULU LAV III, and integrating its firepower with that of the assaulting infantry, the intimate support tanks and the firebase;

c. Section Control. LAV IIIs were best deployed with their sections, providing intimate support to the dismounted infantry from behind or in close proximity; and

d. Firepower. Assaulting infantry suffered a loss of essential firepower and responsiveness when the LAV IIIs redeployed to the flanks during the attack.

91. LAV III Superiority over M113A3. The LAV III was much more effective than the M113A3 in supporting the assaulting dismounted infantry. Besides having a more powerful and stabilized cannon and better sights, the LAV III offered better protection to the vehicle crew (gunner, crew commander and driver). The M113A3 with its exposed crew commander-gunner fared much worse, suffering many casualties.

92. Employment of LAV III. Following the dismounting of infantry during an assault, LAV IIIs were better employed providing intimate support in conjunction with tanks, rather than redeploying to a close-in, flanking firebase position. However, gaming did illustrate both the advantages and risks of employing the flanking firebase deployment. Moving LAV IIIs to one or both flanks to firebase positions protected those vehicles, keeping them out of range from RED's entrenched short range anti-armour (RPG) systems. The better protected Leopard C2s were able to provide the close-in intimate support to the infantry, while the LAV IIIs could neutralize or destroy entrenchments from relative safety. However, LAV IIIs deployed to a flanking firebase position were

found not to be as responsive to the needs of the dismounted infantry in the following circumstances:

a. To provide immediate firepower onto targets;

b. To move forward to provide needed additional ammunition or weapons (eg, ERYX) not carried on the assault; and

c. To move forward to remount infantry being effectively engaged by RED's indirect fire.

Furthermore, it was judged that LAV IIIs in a flanking firebase position could pose more of a lucrative target to RED's direct or indirect fire, rather than being dispersed across the frontage of the assault. The decision to deploy LAV IIIs should be left to the discretion of the tactical commander, rather than doctrinally excluding this tactic outright.

93. Section Control. Intimate support LAV IIIs were more responsive to the immediate needs of assaulting dismounted infantry. However, it was noted that sabot fragments from LAV IIIs firing APFSDS ammuntion would pose a risk to dismounted soldiers deployed in close proximity. Employed in intimate support, the LAV IIIs were able:

a. To react to previously undetected enemy positions;

b. To react to enemy counter-attacks;

c. To continue providing effective direct fire support on or near the objective;

d. To react to heavy enemy indirect fire; and

e. Being in very close proximity to supported infantry, to remount the infantry quickly, and redeploy as necessary. The infantry were able to adapt more quickly to new situations since the LAV III carried those weapons and additional ammunition not carried on the assault for the section.

94. Significance of Targets. BLUE's relative success was dependent on the early destruction or neutralization of RED's tanks, BMP-2s and the entrenched AT-14 team. The LAV IIIs were superior to the M113A3 at destroying or neutralizing RED's BMP-2s, the entrenched AT-14 team and the entrenched short range anti-armour systems.

95. Clearing an Objective vs Loss of Momentum. The RED tactic of shelling immediately forward of his position with artillery raised concerns about the conduct of clearing an objective and maintaining momentum. If assaulting forces have to perform a detailed clearance of all entrenchments to capture an objective, momentum will be lost and heavy casualties may be suffered. Follow-on forces may be required to clear objectives once the leading elements have pushed back RED's artillery observers or provided RED with an excess of targets to be engaged. Alternatively, follow-on forces could by-pass the assaulting force during the clearance operation in order to maintain BLUE's momentum. Reorganization on the objective or excessive time spent on the objective increases the risk from accurate retaliatory indirect fire.

96. Variations On Attack. It was not feasible to assault a prepared position with a platoon instead of a company simply because of the increased firepower of the LAV III over the .50 cal HMG of the M113A3 because a platoon:

a. Lacked the critical mass to withstand casualties and to provide combat power on the objective;

b. Was less able to adapt to new, additional, undetected threats during the assault and on the objective; and

c. Would take longer to clear an objective area normally assigned to a company.

97. Removal of TBM from Leopard C2s. Without a TBM, BLUE was required to manoeuvre and fight the firebase forward to within effective range of the objective before the assault could commence. BLUE's firebase was detected and engaged earlier by RED and the firebase suffered more casualties than in games where BLUE was equipped with a TBM. However, because RED had few long range anti-armour systems and limited available artillery, the loss of the TBM did not prove to be a major factor in this vignette.

98. Firebase Tasks. A review of doctrine in CFP 300-2 (Reference 7) pages 3-8 and 3-9 which details the role of the firebase during the fight through the objective and consolidation phases of the attack, is required. CFP 300-2 stipulates that the firebase shall not engage targets of opportunity in the objective area once the assaulting force arrives to commence its fight through. Instead, "[tanks], which are not accompanying the assault forces, [must] manoeuvre to cut-off positions to prevent the enemy from withdrawing or being reinforced." In IRON RENAISSANCE, it was found that the continuous support from the firebase proved

essential to the BLUE assaulting forces, particularly as RED had sited dummy positions forward, with the AFVs and entrenched infantry in depth. If the BLUE firebase lifted its supporting fire and manoeuvred to cut-off positions as the assault force attacked through the dummy positions, it is judged that RED would have been significantly more effective in inflicting casualties on BLUE, possibly even repulsing BLUE's attack. Any doctrinal review must bear in mind the benefits of giving commanders discretion in the application of continuous fire on targets of opportunity in the objective area (including the use of overhead fire by the firebase) during the 'fighting through the objective' phase of an attack. CFP 305-1 (Reference 12) pages 6-3-3, 6-3-5 and 6-3-9 and CFP 301-2 (Reference 4) page 3-32 refer to the previous, less restrictive doctrine.

ANALYSIS

Mission Success

99. Except for the platoon on platoon excursion, BLUE was successful at taking the defended position.

Loss Exchange Ratio (LER)

100. In this vignette, the RED force consisted of only four vehicles and 12 entrenched positions. It was normally totally destroyed except for the occasional entrenched position that was either too far off to the flank or out of ammunition. The key RED systems were the two T-80Us, two BMP-2s, and the entrenched AT-14 team. For BLUE, the key systems were the Leopard C2 tank and the LAV III. Calculating an LER between key systems did not seem appropriate when there were so few and one of the systems being studied, the M113A3, would not be included. Therefore, since RED was basically totally destroyed, the difference between the two combat teams was determined by considering their respective losses which are described below in the survivability section.

Residual Combat Strength.

101. In terms of the residual combat strength of the combat team, both the losses of Leopard C2 tanks and infantry were considered. It was judged that the half tank squadron could sustain losses of 25% and still accept a follow-on mission. Similarly, it was judged that the infantry could still function if it suffered 40% losses. The difference in crew size between the vehicles resulted in the M113A3 infantry company being able to dismount more infantry than the LAV III company (101 vs 88 soldiers). This analysis did not consider vehicle crew losses.

102. Dismount On Objective. The M113A3 combat team lost 40% of its Leopard C2s (4.0 of 10) and 75% of its infantry (76.2 of 101) compared to the LAV III combat team which lost 28% of its Leopard C2s (2.8 of 10) and 63% of its infantry (55.5 of 88). Using the above criteria, both combat teams were judged incapable of accepting a follow-on mission because of the high losses.

103. Dismount Before Objective. The M113A3 combat team lost 42% of its Leopard C2s (4.2 of 10) and 51% of its infantry (51.0 of 101) compared to the LAV III combat team which lost 28% of its Leopard C2s (2.8 of 10) and 34% of its infantry (30.0 of 88). Using the above criteria, the LAV III combat team was judged to be capable of accepting a follow-on mission whereas the M113A3 combat team was judged incapable of accepting a follow-on mission because of the high losses.

Lethality

104. Since the vehicles being studied have no capability to destroy the T-80U, this analysis will focus on the contribution each vehicle made to destroying the two BMP-2s and the 12 entrenched positions. Table 5 shows the contribution of the two vehicles being studied in both dismounting on and before the objective. The results indicate that the M113A3 was solely an APC and had minimal contribution to the battle in terms of BLUE kills. The LAV III on the other hand made a substantial contribution to BLUE kills of BMP-2s (25% and 40%) and entrenched positions (22.4% and 25.6%). Not shown in the table is the fact that the Leopard C2 tank was the major contributor to BLUE kills and in particular the destruction of RED trenches.

Table 5

M113A3/LAV III Contribution to RED Losses of BMP-2s and Entrenched Positions

Vignette		M113A3/LAV III Contribution	
		BMP-2	Entrenched Position
On Objective	M113A3	0%	1.7%
	LAV III	25%	25.6%
Before Objective	M113A3	10%	3.8%
	LAV III	40%	22.4%

Survivability

105. BLUE combat team losses for dismounting on and before the objective are shown in Table 6. The results indicate that the LAV III combat team was more effective in both vignettes. In the dismount on objective vignette, the LAV III combat team suffered fewer losses of APCs (6.8 vs 8.0), infantry (55.5 vs 76.2) and Leopard C2 tanks (2.8 vs 4.0) compared to the M113A3 combat team. Similarly, in the dismount before objective vignette, the LAV III combat team suffered fewer losses of infantry (30.0 vs 51.0) and Leopard C2s (2.8 vs 4.2). Both combat teams lost the same number of APCs in this vignette (4.0 APC). The vulnerability of the crew commander of the M113A3 is also evident with 5.0 commanders being killed by small arms or indirect fire when dismounting on the objective and 6.0 being killed when dismounting before the objective.

Table 6
M113A3/LAV III Combat Team Losses in the Attack

Vignette		Combat Team			Crew Commanders	
		M113A3/ LAV III Losses	Total Infantry Losses	LEO-C2 Losses	Losses to small arms and indirect fire	Total Losses
On Objective	M113A3	8.0	76.2	4.0	5.0	12.4
	LAV III	6.8	55.5	2.8	0.0	6.8
Before Objective	M113A3	4.0	51.0	4.2	6.0	9.0
	LAV III	4.0	30.0	2.8	0.0	4.0

106. During this vignette, the procedure of dismounting infantry before the objective proved far superior to dismounting on the objective. More infantry were able to manoeuvre onto the objective, thereby increasing the mass and firepower available to overcome RED. Dismounting before the objective resulted in considerably fewer combat team losses compared to dismounting on the objective. Table 6 shows that by dismounting before the objective, approximately half the number of APCs were lost (4 vs 8) and approximately three more sections of dismounted assaulting infantry survived (21 soldiers). However, it must be stated clearly that this report is not advocating the use of the "Dismount Before the Objective" procedure in every circumstance. Clearly, if RED had engaged BLUE with mortars and machine guns, and/or had deployed obstacles such

as wire fences, low wire entanglement and anti-personnel or area mines forward of the entrenchments, then BLUE's dismounted infantry would have been further separated from the protection offered by the intimate support Leopard C2s and they would likely have suffered additional casualties before arriving at RED's entrenchments. The protection offered to the infantry by remaining mounted inside the LAV IIIs until the latest feasible moment would afford BLUE the capability of assaulting RED with more forces and firepower, thereby improving the likelihood of success.

EXCURSIONS

LAV III to Firebase

107. Analysis of the LAV III to firebase excursion showed that there was not a difference in contribution by the LAV III to BLUE kills. However, when comparing combat team losses, the infantry company lost an additional 21 soldiers and the tank squadron lost two additional Leopard C2s when the LAV III deployed to the firebase. These higher losses were attributed to several factors, one of which was the time delay required for the LAV IIIs to reach the firebase and engage RED allowing RED's short range anti-armour systems to engage BLUE. Another factor was the delay in remounting the sections under RED's effective artillery fire.

Platoon on Platoon

108. In general, the platoon on platoon excursion was unsuccessful. In four of the five runs, BLUE was forced to break off the attack because of infantry losses. The platoon on platoon excursion was similar to the company on platoon (baseline) vignette in that both formations lost two to three LAV IIIs during the approach before they reached the line of departure. The difference between the vignettes is that these LAV's were carrying 66% of the assaulting force for the platoon on platoon excursion compared to only 18% for the baseline vignette. The reduced firepower from a platoon of LAV IIIs compared to a company of LAV IIIs also allowed RED's entrenched anti-armour systems to destroy more Leopard C2s (4.0 vs 2.8). The firepower of the LAV III does not and cannot compensate for the reduction in size of the assaulting force. A platoon cannot attack and clear what would normally be a company task solely on the basis of improved fire support from the LAV III. A platoon does not have the critical mass to sustain casualties, to clear

an objective normally assigned to a company and to react to new or changing situations during the assault.

Other Excursions

109. The size of the RED force and the length of the vignette provided insufficient targets of opportunity to bring out any statistical differences in the BLUE excursions. Analysis of these excursions will be limited to J&L

SUMMARY

110. Although the M113A3 and LAV III combat teams were successful at defeating RED, the LAV III was much more effective in supporting the assaulting dismounted infantry. The M113A3 had no impact on RED casualties because of the vulnerability to small arms and indirect fire of the crew commander and the mounted HMG. On the other hand, the LAV III contributed significantly to BLUE's success because of its improved firepower and protection. The LAV III combat team suffered fewer losses than the M113A3 combat team. In general, the M113A3 combat team lost one Leopard C2 and 21 infantry soldiers more than the LAV III combat team.

111. Analysis of the LAV III deployment options clearly demonstrated that the LAV III was most effective when deployed with its section, providing intimate support to the dismounted infantry from behind or in close proximity. The relative merits and disadvantages of each option are summarized below:

a. Intimate Support from Behind Dismounted Infantry. Intimate support LAV IIIs were more responsive to the immediate needs of the assaulting dismounted infantry, being able to provide continuous effective direct fire support on or near the objective in conjunction with tanks. The LAV IIIs could react quickly and effectively to previously undetected enemy positions, enemy indirect fire and enemy counter-attacks. Being in close proximity to the supported infantry, the LAV IIIs could perform immediate resupply, providing additional ammunition and those weapons not carried on the assault when needed. Furthermore, the infantry could remount the LAV III quickly and redeploy as required. However, the LAV III was

particularly vulnerable to RED's short range anti-armour systems when operating in the area of the objective. Finally, it was noted that sabot fragments from LAV IIIs firing APFSDS ammuntion would pose a risk to dismounted soldiers deployed in close proximity.

b. Near Firebase to the Flank(s). Immediately following the dismount of the assaulting infantry, the deployment to one or both flanks kept the LAV IIIs out of range from RED's short-range anti-armour systems. The LAV IIIs were able to provide support to intimate support Leopard C2s and assaulting infantry by engaging entrenchments from relative safety. However, being further away and observing the objective from a different perspective than the assaulting infantry and tanks, the flanking LAV IIIs could not always detect or provide firepower onto priority targets. Similarly, it took more time to move forward to perform immediate resupply or to remount the infantry. The LAV IIIs in the flanking position(s) attracted RED's fire.

112. An effective means of commanding and controlling the ZULU LAV III and integrating its firepower with that of the assaulting infantry, the intimate support tanks and the firebase must be established. Guidelines or procedures should be produced identifying the responsibilities and locations of commanders during the advance and attack.

113. The more effective firepower of the LAV III does not and cannot compensate for the reduction in size of an assaulting force. The reduced firepower from a platoon of LAV IIIs compared to a company of LAV IIIs enabled RED to destroy proportionally more of the assault force. A platoon does not have the critical mass to sustain casualties, to clear an objective normally assigned to a company and to react to new or changing situations during the assault.

114. Gaming identified the requirement for a review of the following doctrinal issues:

a. Clearing an Objective vs Loss of Momentum. An effective means of maintaining the momentum must be established during the advance. The responsibilities of following forces must be clarified.

b. Firebase Tasks. The current doctrine is too restrictive regarding the responsibilites of the firebase during the fight through the objective phase of an attack. Guidelines or procedures should be produced giving discretion to tactical commanders.

IV. CONCLUSIONS

115. M113A3 Compared to the LAV III. In the attack and defence, the LAV III was superior to the M113A3, being more effective at supporting the infantry combat team.

a. Defence. In the defence, both the LAV III and M113A3 battle groups were successful at defending the position. However, the range of the LAV III's 25mm cannon allowed it to engage and destroy RED's BMP-2s before the infantry could dismount and attack the defensive position. The .50 cal HMG of the M113A3 was unable to destroy RED's BMP-2s before the infantry could assault and establish a foothold on the position. The LAV III battle group suffered only 2/3 the losses and achieved 1.6 times the LER of the M113A3 battle group. The LAV IIIs in the infantry company were responsible for killing three times the number of key RED systems as the .50 cal HMG of the M113A3 company.

b. Attack. In the attack, the LAV III was again superior to the M113A3 in supporting the infantry combat team. The LAV III contributed significantly to BLUE's success because of its improved firepower and protection. The M113A3 had no impact on RED casualties because of the vulnerability to small arms and indirect fire of the crew commander and the mounted HMG. In general, the M113A3 combat team lost one Leopard C2 and 21 infantry soldiers more than the LAV III combat team.

116. LAV III Deployment Options. The LAV III does not have the protection to allow it to manoeuvre in the presence of the enemy. Furthermore, the mobility of the wheeled LAV III restricts its flexibility to manoeuvre and to adapt to current battlefield situations. Finally, it was noted that sabot fragments from LAV IIIs firing APFSDS ammuntion would pose a risk to dismounted soldiers deployed in close proximity.

a. Defence. In the defence, the LAV III was most effective when dug in on the position as an integral part of the infantry company where they were better concealed, more dispersed, and better protected. LAV III firepower was more likely to be available at maximum effective range forward of

BLUE's main defensive position when it was most needed - during RED's assault. When sited to the flank(s), forward or behind, or employed in a counter-attack role, the effectiveness of the LAV III was reduced for three reasons. First, it was required to manoeuvre in the face of the enemy. Second, the range and availability of its firepower was reduced. Third, the LAV IIIs lacked the area to disperse thereby increasing the likelihood of being detected and neutralized.

b. Attack. In the attack, the LAV III was most effective when deployed with its section, providing intimate support to the dismounted infantry from behind or in close proximity. Intimate support LAV IIIs were more responsive to the immediate needs of the assaulting dismounted infantry, being able to provide continuous effective direct fire support on or near the objective in conjunction with tanks. The LAV IIIs could react quickly and effectively to previously undetected enemy positions, enemy indirect fire and enemy counter-attacks. Being in close proximity to the supported infantry, the LAV IIIs could perform immediate resupply, providing additional ammunition and those weapons not carried on the assault when needed. Furthermore, the infantry could remount the LAV III quickly and redeploy as required. However, the LAV III was particularly vulnerable to RED's short range anti-armour systems when operating in the area of the objective. Deploying the LAV III to one or both flanks as a near firebase immediately following the dismount of the assaulting infantry would keep the LAV IIIs out of the effective range of RED's short range anti-armour systems. Being further away from the supporting tanks and infantry, the LAV IIIs could not always detect or provide firepower onto priority targets. It took more time to move forward to perform immediate resupply or to remount the infantry.

None of these deployment options should be discounted outright. However, tactical commanders must be aware of their associated risks.

117. Impact of LAV III on Task Organization. The more effective firepower of the LAV III does not and cannot compensate for the reduction of an assaulting force. The reduced firepower from a platoon of LAV IIIs compared to a company of LAV IIIs enabled RED to destroy proportionally more of the assault force. A platoon does not have the critical mass to sustain casualties, to clear an objective normally assigned to a company and to react to new or changing situations during the assault.

118. Doctrinal Review. Gaming identified the requirement for a review of the following doctrinal issues:

a. Command and Control. An effective means of commanding and controlling the ZULU LAV III and integrating its firepower with that of the infantry and support tanks must be established. Guidelines or procedures should be produced identifying the responsibilities and locations of commanders during the defence, advance, and attack.

b. Clearing an Objective vs Loss of Momentum. An effective means of maintaining the momentum must be established during the advance. The responsibilities of following forces must be clarified.

c. Firebase Tasks. The current doctrine is too restrictive regarding the responsibilities of the firebase during the fight through the objective phase of an attack. Guidelines or procedures should be produced giving discretion to tactical commanders.

CONCLUDING STATEMENT

119. This report demonstrates that the LAV III is more combat effective and versatile than the M113A3. The LAV III proved itself to be most effective when under section control. However, limitations on its mobility, protection, and firepower restrict its tactical flexibility and deployment.

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DEFINITION OF BLUE'S TBM FOR LEOPARD C2

Performance

- Laser beam rider/TANDEM warhead
- Able to fire while moving

Ranges

- Minimum: 100 metres
- Maximum: 5,500 metres

Cruising Speed: 390 metres/second

Penetration: 1150 mm rolled homogeneous armour

Basic Load: 4 x rounds (replaced 4 x HESH)

ABBREVIATIONS AND DEFINITIONS

AFV	Armoured Fighting Vehicle.
AGS-17	30mm automatic grenade launcher which can be mounted on a tripod or vehicle.
APC	Armoured Personnel Carrier. An armoured vehicle intended to provide an infantry section with transportation, armour protection and defensive firepower.
APFSDS	Armour Piercing, Fin Stabilized, Discarding Sabot. The primary anti-armour ammunition of the Leopard C2, T-80U, and LAV III.
AT-14	The laser beam riding anti-tank missile equipping the motor rifle battalion anti-tank platoon and carried by the BMP-2 in this study.
BMP-2	The BMP-2 used by the RED Force in this study is an infantry fighting vehicle equipped with a 30mm gun and four AT-14 missiles. It carries a crew of three and up to seven passengers.
CABG	Computer Assisted Board Game. A war game developed by DLOR employing game tables with map enlargements, game pieces symbolising weapons or units and rule areas.
cal	Calibre.
CFP	Canadian Forces Publication.
coy	Company.
DGOR	Director General Operational Research.
DLOR	Directorate of Land Operational Research. The 1996 reorganization of the Operational Research Division deleted this directorate and the War Games Section was assigned to DOR(J&L).
DOR(J&L)	Directorate of Operational Research(Joint & Land).
DPICM	Dual Purpose Improved Conventional Munitions. Artillery delivered top attack, shaped charge bomblets able to engage armoured fighting vehicles and personnel.
DS	Direct support An artillery tactical task by which an artillery unit provides forward observers, coordination, communications and advice to a supported infantry or armoured unit.
ERA	Explosive Reactive Armour. Blocks added to the hull and/or turret of an armoured fighting vehicle to enhance its protection against chemical warheads.
ERYX	The current Canadian short range anti-tank guided missile.
FB	Fire base.
HMG	Heavy machine gun.

LD	Line of Departure. A control measure indicating a line on the ground which is crossed by an attacking force at H-hour, on the way to its objective.
LAV III	The Canadian APC based on a MOWAG 8x8, Generation 3 chassis and armed with a stabilized 25mm gun and TI. It has a crew of three and carries seven passengers.
KZ	Kill Zone.
MBT	Main Battle Tank.
MOE	Measure of Effectiveness. A specific measurement chosen by the game scientist which supports the aim of the project.
MT-12	100mm smoothbore anti-tank gun mounted on a two-wheeled, split-trail carriage.
M113A3	The current Canadian tracked APC, armed with a .50 calibre heavy machine gun.
NBC	Nuclear, biological and chemical.
OP	Observation post.
OR	Operational research.
ORD	Operational Research Division. The resources of DGOR.
pl	Platoon.
recce	Reconnaissance.
TBM	Through-the-barrel missile. An anti-tank missile launched from a tank gun.
TI	Thermal Imager.
TUA	TOW Under Armour. The Canadian long range anti-armour weapon system based on a M113A3 chassis with a two-tube armoured turret. In this study the TUA fires TOW 2B missiles and has a basic load of 12 missiles.
T-80U	The RED Force main battle tank used in this study.
ZULU LAV III	The LAV III vehicle occupied only by its three-man crew, the remaining personnel from the rifle section having dismounted.

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This study evaluates the infantry combat team quipped with the LAV III compared to the present day combat team equipped with the M113A3 for conventional operations in war in the year 2006. Since consideration is being given to totally replacing the M113 family of armoured personnel carriers and TOW Under Armour with the LAV III within infantry battalions, emphasis is given to evaluating the various LAV III deployment options in the defence and attack.

The study finds that the LAV III is more combat effective and versatile than the M113A3. The LAV III proved itself to be most effective when under section control. However, limitations on its mobility, protection and firepower restricted its tactical flexibility and deployment. The study recommends a review of three doctrinal issues – Command and Control; Clearing an Objective vs Loss of Momentum; and Firebase Tasks.

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LAV III
Warfighting
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